THE

GEOGRAPHICAL MAGAZINE.

EDITED BY

CLEMENTS R. MARKHAM, C.B., F.R.S.

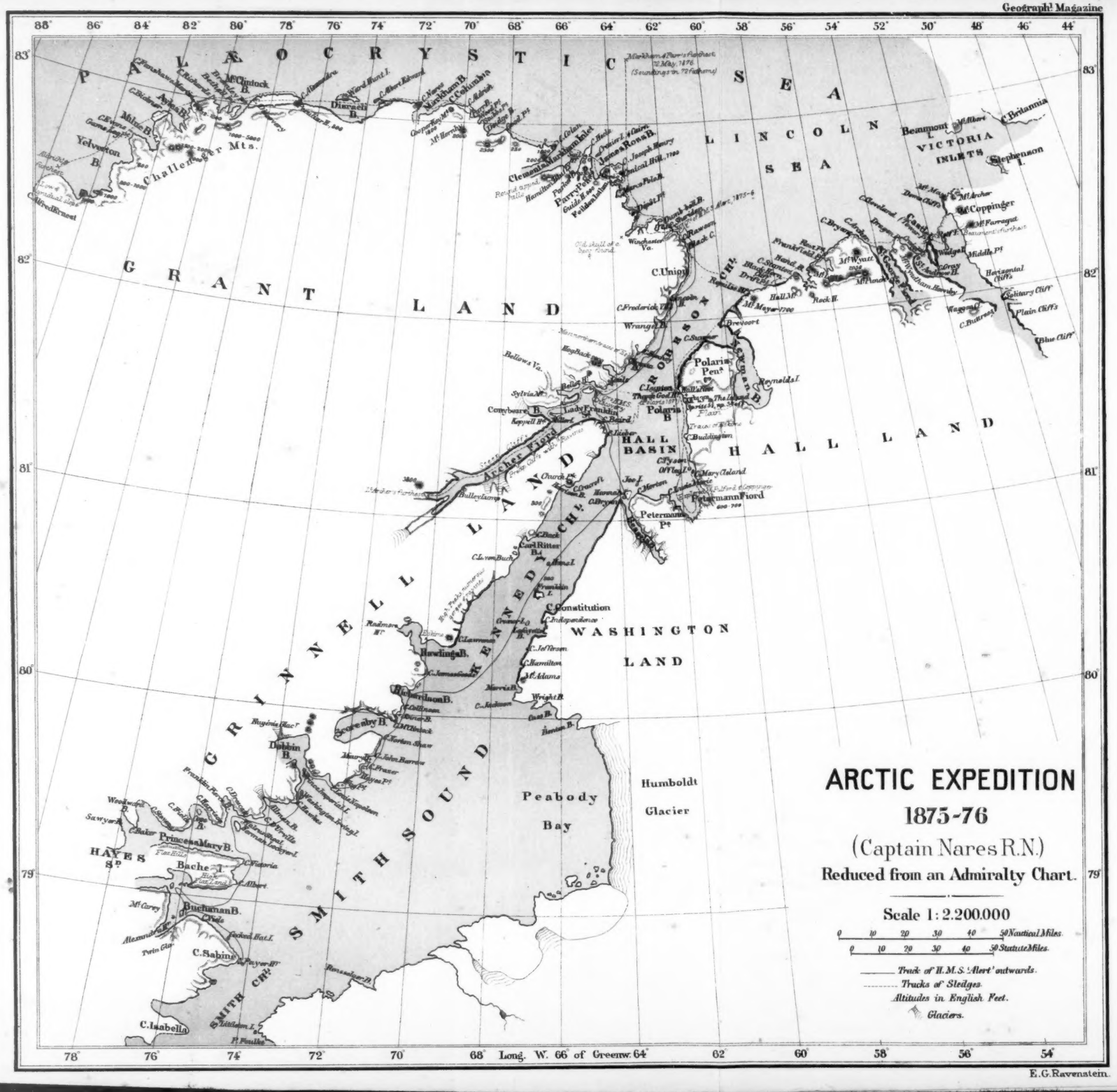
VOLUME IV.—1877.

ILLUSTRATED WITH TWENTY-TWO MAPS.

LONDON:

TRÜBNER & Co., 57 AND 59, LUDGATE HILL, E.C.

1877.



E. G. Ravenstein.

THE

GEOGRAPHICAL MAGAZINE.

JANUARY, 1877.

THE ARCTIC EXPEDITION.

XI.

The Results.

In our last number we discussed the work of the Arctic Expedition, compared it with that of former Expeditions, and proved that the explorers of 1876 were second to none when the exceptional difficulties they had to encounter are considered, and second only to two, namely McClintock and Mecham, when judged by the test of figures alone. We now propose to glance at the results of this work. At present it is not possible to do more than indicate the nature of these results; for it will take time to work up the vast mass of observations in numerous branches of science, and the large geological, botanical, and zoological collections.

The results of scientific importance to be derived from an examination of the immense unknown area round the North Pole were shown in the Memorandum of the Royal Geographical Society's Arctic Committee of 1873 to be as numerous as the region to be explored is extensive. The Expedition secured these results so far as regards that portion of the unknown area which was within reach, from the base established in 82° 27′ N., and longitude 63° W. Thus a good commencement was made in the examination of the Polar region, important discoveries were achieved, and a great store of additional knowledge and experience was accumulated.

In geography the Royal Geographical Society's Arctic Committee pointed out that, by the Smith Sound route, a problem of great importance would be solved by ascertaining the extent and nature of the northern coast of Greenland, by exploring the land to the westward, and discovering the conditions of land and sea in that portion of the unknown area.

The Expedition has secured these results. The western coast of the channels, from the entrance of Smith Sound to the Palæocrystic Sea, a distance of upwards of 200 miles, has for the first time been surveyed and accurately delineated. The shores of the Palæocrystic Sea, westward from Robeson Channel, have been discovered and surveyed, and its physical geography has been fully ascertained for a distance of 250 miles. The north coast of Greenland was also discovered for about 100 miles; with its deep inlets and off-lying islands.

Next to the geographical come the kindred hydrographic results; and the Committee urged that, as regards the unknown seas, their hydrography has a most important bearing on the general question of oceanic currents, a question which is of practical consequence to navigation. The discoveries of the Arctic Expedition, in this one branch of inquiry, are so important that they alone are worth the whole expenditure twice over.

On reaching the northern outlet of Robeson Channel, instead of finding the navigable sea and continuous land trending polewards that they had been led to expect, the explorers found the land trending east and west, and that the sea was covered with broken-up ice of immense thickness and great age. The phenomena connected with this remarkable frozen sea, so unlike anything hitherto seen by Arctic voyagers, except by McClure off Banks Island, are of the utmost importance as regards the general hydrography of the globe. The explorers had reached the most desolate solitudes hitherto discovered. Marine life almost entirely ceases. There is no whale's food, no cetaceans, no seals, no bears, and no birds take their flight across the Sea of Ancient Ice. Its huge floes are from 80 to 100 feet in thickness, and the pieces broken off and forced upon the shore have all the characteristics of icebergs, fragments of these mighty frozen glaciers. They, therefore, very appropriately received the name of floe-bergs.

Physical geography, like every other science, needs special names for new phenomena; and differing as it does from all other known seas in the extraordinary character of its huge floes, the Sea of Ancient Ice, bordering the most northern known land in the world, needed a special name to distinguish it from other ice-bearing seas. It received the appropriate and convenient designation of the Palæocrystic Sea (παλαιὸς, ancient, and κρυσταλλος, ice), a term which will in future serve to distinguish the ocean which is laden with floes of enormous thickness and great age, extending for 1200 miles from the coast of North America to the north shores of Greenland.

In his paper read before the Geographical Society, on the 12th of December, Sir George Nares briefly described the position of the Palæocrystic Sea in the hydrographic economy of the globe. He pointed out that a considerable body of warm water flowed from the Atlantic towards Spitzbergen, and a smaller one from the Pacific, through Behring Strait into the North Polar Basin; and that so large a volume could not be continually flowing into an inclosed space without running out elsewhere. Accordingly, in all other channels leading from the Palæocrystic Sea an

icy cold surface current is running to the southward. The two principal cold currents flow down the east coast of Greenland, and the west side of Baffin's Bay, at an average rate of about 4 miles a day as shown from the drift of the 'Hansa.' This rate, however, is only obtained in the East Greenland current south of about 75° N., where a stronger current, coming from the north-east unites with the Greenland current.

Sir George Nares describes the Polar Basin as a locked-up bay continuing out of the narrowed North Atlantic Channel, with a warm stream of water constantly pouring into it between Norway and Spitzbergen, and cold currents always running out between Spitzbergen and Greenland, and through narrow straits between Greenland and America. Thus is heat and cold distributed over a great part of the globe, and the temperature of the sea on the border of the cold current, only 2200 miles from the Equator, is the same as that in the warm current, midway between Norway and Spitzbergen, at nearly double the distance from the Equator.

Before the Palæocrystic Sea was discovered by the Arctic Expedition, the heaviest known ice was that which drifts down the east coast of Greenland and round Cape Farewell, and that seen by Collinson, McClure, and Mecham, pressing upon the shores of Banks and Prince Patrick Islands. At the north point of Prince Patrick Island it is lost, for Richards and Osborn found light ice along the north shores of the Parry Islands. Osborn, therefore, concluded with certainty that this light ice betokened a narrow channel, and that some protecting land existed to the northward. The discoveries of the Arctic Expedition extended for 300 miles along the shores of the Palæocrystic Sea, leaving 400 miles unknown from Aldrich's furthest to Ireland's Eye off the north point of Prince Patrick's Island, and 500 from Beaumont's furthest to Cape Bismarck.

Sir George Nares and his officers were on this Sea of Ancient Ice for eleven months. They examined it, and all the phenomena connected with it, explored its shores for 300 miles, and penetrated into its labyrinths of floes and hummock-ridges, until ten of them attained the highest latitude ever reached by any human beings. The names of those ten men should be placed on record. They are—

ALBERT H. MARKHAM,	ALFRED A. CHASE PARR,
Thomas Rawlings,	Edward Lawrence,
Thomas Jolliffe,	William Maskell,
John Radmore,	John Pearson,
Daniel Harley.	William Ferbrache.

By reasoning on evidence, which will hereafter be more fully set forth, Sir George Nares came to the conclusion that a very broad sea extends north of Cape Colombia, at least as far as the Pole, that the land trends southwest towards Prince Patrick Island, and that the coast of Greenland does not extend much further north than Cape Britannia. The probable trend of the coasts is indicated by similarity of tides between two known points, prevailing winds, and the nature of the movements of the ice.

It is certain that there is a large sea, and that the sea is covered with ice during the winter. In the summer, from various causes, this ice becomes subject to motion by the winds and currents, and gradually breaks up into fields and floes, which are ever decreasing in size as the season advances. Soon after the first week in July the whole pack of ice begins to drive backwards and forwards, according to the wind or current, its main course being towards the channel of outlet, where it escapes in small quantities out of the Polar Basin. Gaining more room as the season advances, the pack itself gradually breaks up, when any space left vacant is immediately occupied by the frozen masses, each field and floe struggling and forcing its way to get a clearer space. Towards the end of September the increasing frost begins to cement together the contending masses, and by November the whole sea is quiet again, the ice only cracking occasionally with the tidal currents. The new formation of ice during seven months in the year more than equals the decay during the other five.

Thus the pack covering the Palæocrystic Sea is a collection of separate pieces of ice, moving among each other during the summer, each piece grinding against its neighbour as the whole jostles its way along, slowing pressing forward towards the outlet between Spitzbergen and Greenland.

Whatever quantity of land may hereafter be discovered, Sir George Nares considers that the area of the Palæocrystic Sea will be found to cover at least one and a-half million square miles. The principal outlet, between Greenland and Spitzbergen, is not more than 300 miles wide; and, by the largest estimate, less than half a million of square miles of ice can escape in the year. Thus two-thirds of the total quantity would be left behind. But in reality very much less escapes, as is proved by the great thickness of the floes; which must be at least a hundred years old. The discovery of the extent and nature of this Sea of Ancient Ice, and the careful observations of its movements, of its tides, winds, and currents, and of all the phenomena connected with it, is one of the important results of the Arctic Expedition. These discoveries have thrown a flood of light on the physical geography of the Polar area.

The meteorological observations of the Expedition were most complete, and were all the more valuable because they consist of two series taken at two stations which, though only 70 miles apart, were very differently situated as regards surrounding land and sea. One faced the Palæocrystic Sea, while the other was within Robeson Channel. The phenomena of magnetism in the vicinity of the Pole were also considered to be of much scientific importance, and a very complete series of observations was taken at the two stations, as well as in other localities; while valuable observations were diligently made in other branches of physics.

A more complete investigation of the geology of the Arctic Regions was represented to be extremely desirable, both for its scientific importance and for the value of its practical results. The most interesting point connected with Arctic Geology is that having reference to the luxuriant vegetation of the miocene period, which was known to have existed in Greenland as far north as the 72nd parallel.

The Arctic Expedition has now discovered that these forests extended as far north as 82°; and the establishment of this fact is another result of such importance as to be worth the whole cost of the expedition twice over. Coal was found a few miles

north of the winter-quarters of the 'Discovery,' of good quality, with numerous impressions of leaves on the overlying shale. The existence of this forest so near the Pole will give rise to speculations in which not only the science of geology but also that of astronomy is involved. It supplies evidence as to the physical conditions of the globe in past geological epochs. Most careful collections of impressions in the shale, and of the coal itself, were made; and specimens of fossils and rocks were collected from Cape Isabella to the furthest points discovered east and west of Robeson Channel, including an upper Silurian series, the miocene of the coal-beds, and the mountain limestone corals and shells of Cape Joseph Henry. Observations were also diligently made with reference to glacial action, to the effects of frost upon rocks, to evidence of the upheaval of the land, and to other geological phenomena.

As regards botany, a complete and exhaustive collection of plants was made, which will reveal the history of vegetation over a considerable area. Though this is one of the most poverty-stricken regions on the globe, as regards plants, Dr. Hooker has pointed out that it is possessed of unusual interest. The zoology of the newly discovered region has also been thoroughly investigated, and most valuable collections have been made, through the indefatigable labours of Captain Feilden and Mr. Hart, zealously assisted as they were by every officer in the expedition. The sea was made to yield up every living thing it contained, from the crustaceans 72 fathoms beneath its surface in 83° 20′ 26″ N., the most northern animals ever obtained. On the land everything that had life was diligently sought for and preserved, including a large collection of minute organisms only visible under the microscope, insects, fish, birds, and mammals. The distribution of animal life was also carefully studied, as well as the habits of the larger animals. In fact, for the first time, naturalists will have a complete and exhaustive knowledge of the biology of an extensive region, hitherto unknown.

The above notes only convey the merest sketch of the work that has been done. The observations still have to be worked up, the large collections have to be examined and each individual to be described. So that it will necessarily be some time before the complete results can be given to the world; and before the President and Council of the Royal Society will be able to pronounce a verdict on their value. Enough, however, is known to make it certain that, so far as scientific results are concerned, this is the most successful expedition that ever crossed the Arctic Circle. That of Sir John Franklin, with such men on board as Fitzjames, Fairholme, and Goodsir, must have done admirable work, but alas! it is lost to the world. The first voyage of Parry was, in its day, a great success; but it was before the time of exploration by sledge-travelling, and scarcely anything was done from the base of winter-quarters. The Search Expeditions, from 1848 to 1854, were not despatched for discovery or scientific research. Their objects were very different, and their great use was in having developed the system of exploring by sledge-travelling.

In stating the fact that the Expedition of 1876 was the most successful, it must not be supposed that there is the least shadow of depreciation cast upon the memorable and glorious efforts of its predecessors. Its members were equal to their predecessors in determination, in hardihood, and in ability; but not superior. Their greater success arises from the facts that they had, in many respects, approved appliances, especially as regards steam, and above all that they had the full benefit of the examples and of the experience of those who went before them.

Not the least important result of the late Arctic Expedition is that a new generation of Arctic officers has been trained as ice-navigators and sledge-travellers, young and zealous, and who are ready to come forward to repeat such glorious work as they have already achieved, whenever an opportunity offers. It was this result which Sherard Osborn looked upon as of as much consequence as any other; and now that the traditions of that illustrious seaman and of his comrades have been handed down and placed in the safe-keeping of such gallant successors, one of the dearest wishes of his generous heart have been fulfilled within two years of his lamented death.

When the welcome tidings of the safe return of the Expedition were first received, and the particulars of its marvellous labours and great success were made public, we wrote of those labours and of that success as they then struck us. In our previous and in the present number we have made a searching comparative analysis of the work of the explorers,* and have enumerated the results they have achieved. We have proved the correctness of what we first said, and we can now, therefore, emphatically repeat it in the same words:

"The most successful Arctic Expedition that ever left the shores of England has returned safely, after achieving an amount of valuable work such as has never been equalled, in the face of the most appalling hardships and difficulties. The success is absolutely complete; and all that not only can be done, but that real geographers ever wished to be done, has been achieved in the direction of Smith Sound."

XII.

THE OUTBREAK OF SCURVY.

THE outbreak of scurvy among the explorers in the late Arctic Expedition was a terrible calamity. Yet the incidents connected with it give rise to feelings of pride and admiration. It enhanced the difficulties of the work, and the merit of having overcome them; and there is nothing in the whole annals of Arctic heroism that surpasses the gallantry of the sledge-travellers of 1876. With helpless men on the sledges, with their own work more than doubled, themselves stricken and suffering, yet these British seamen actually struggled onwards towards the Pole, resolved to uphold the honour of their flag and of their profession. At least, we may thank the scurvy for having added such a tale to the history of British prowess.

But the danger that was escaped was so imminent,

* The following corrections should be made in our article on the work of the Arctic Expedition, in our December number. At page 315, column 2, line 9 from the bottom, for −35° read −25°. At page 316, column 1, line 18 from the bottom, for −14° read −44°.

and so terrible, that its character and the means of avoiding it demands the most careful and searching investigation.

In our previous number we briefly indicated the line such an investigation should take in order to arrive at useful conclusions; and we pointed out that the causes must be sought by comparison with the conditions influencing this and any previous Arctic Expedition which had no scurvy. We propose now to establish this view more fully and completely.

The cause of scurvy is frequently attributed to want of fresh vegetable food, and it is confidently affirmed by one school that lime-juice fully supplies the place of vegetables, and that scurvy can always be kept away by the use of lime-juice. This dogmatic assertion, which was recently put forward in a leading article in the *Times*, can be proved to be untenable. There are many instances of scurvy breaking out when lime-juice has been regularly administered. Dr. Ede informs us that he has seen cases of scurvy when lime-juice was given, and the men had been on salt beef and pork, with biscuit and no milk in the cocoa or tea, for nine months. So that lime-juice alone is not sufficient to entirely prevent scurvy. Another school of doctors, headed by Dr. Garrod, holds that the acid treatment is a mistake, and that scurvy is due to a deficiency of potash salts in the blood; while Dr. Black maintains that lime-juice is perfectly useless, and that scurvy in the Arctic Regions is solely due to a want of the means of keeping up the necessary heat of the body. Hence he advocates the use of blubber, of food containing sugar and starch, and of all heat-producing foods. Sir John Ross also believed that fish-oil was one of the anti-scorbutics provided by nature for the inhabitants of an Arctic land. The fact that far more nourishment is required in the frigid than in the temperate zone corroborates Dr. Black's view.

The truth, no doubt, is that the predisposing causes of scurvy are far more numerous and complicated than the lime-juice dogmatists are willing to allow. Among these are imperfect or too great sameness of diet, the absence of light, intense cold, and damp, when these deleterious conditions are unusually prolonged. It is generally assumed that the primary cause of scurvy is the want of vegetables. The predisposing causes in the Arctic Regions are the long winter and its accompanying privations, and the exciting causes are exceptionally hard work, or other similar conditions.

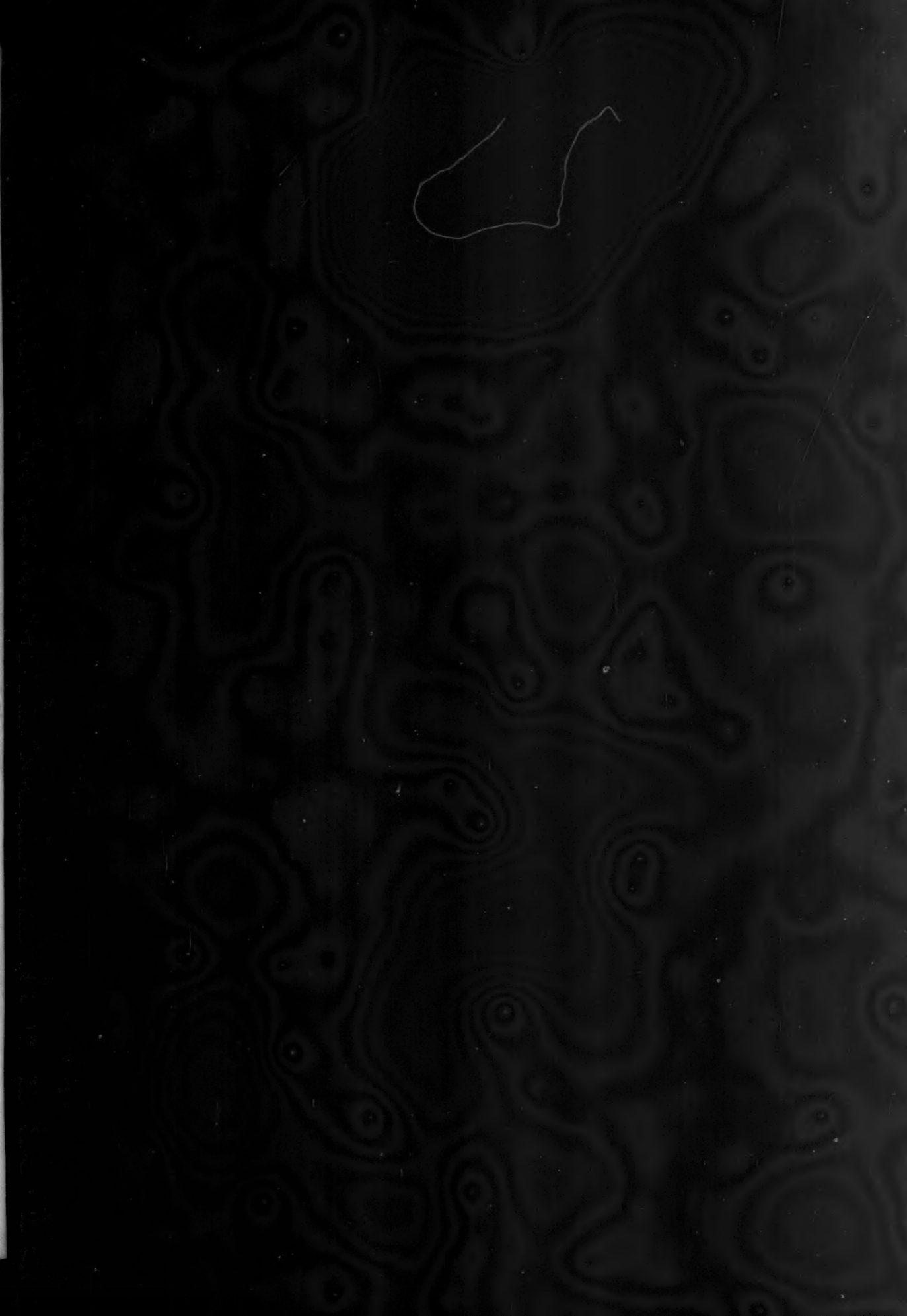
The 'Assistance,' one of the ships in the Arctic Expedition of 1850-51, returned to England without having had the shadow of a symptom of scurvy on board. Lime-juice was regularly administered during the winter; but, in the first instance, the freedom from scurvy arose from the varied diet more than from the lime-juice. In Baffin's Bay we brought off twenty-one dozen eggs at one place, twelve dozen at another, 315 looms at Cape Shackleton, besides eggs of dovekies, rotches, and terns in great numbers. The winter darkness lasted for ninety-four days, during which time an excellent routine of exercise and employment was observed; the people were kept amused, and there never was any sign of scurvy on board.

We may now compare the experiences on board the 'Assistance' with those of the 'Alert' and 'Discovery.' In the late expedition lime-juice was administered to every soul on board both ships with the utmost regularity. In no former expedition was more care taken in this respect. The daily issue was commenced on the 7th of June, nine days after leaving England. The men were mustered on the quarter-deck at half-past ten every forenoon and the allowance was issued and drunk there and then, in the presence of an officer, by every man on board. This was continued without intermission during the whole period of the absence of the expedition. The rest of the diet was practically identical with that on board the 'Assistance,' and the routine and general arrangements were the same. But there was one great and important difference. The winter darkness in the 'Assistance' only lasted for 94 days, while the crew of the 'Alert' had to endure a winter darkness of 142 days. Thus the period of darkness on board the 'Alert' was half as long again as that in the latitude where the 'Assistance' wintered. Moreover, at the 'Assistance's' winter quarters, there was never total darkness at noon, while with the 'Alert' there was greater darkness during the whole time from November 6th to February 5th than there was on the darkest day with the 'Assistance.' The intense cold, and the inevitable damp were also more prolonged; and the men of the 'Alert' were consequently exposed to darkness, damp, and extreme cold for a period half as long again as those of the 'Assistance.'

The diet, the use of lime-juice, and the routine were all the same in the 'Assistance' and in the 'Alert.' The only difference, and it was immense, was in the length of the winter darkness and its accompanying prolonged cold and damp. In Sir Edward Parry's first expedition of 1819-20, lime-juice was issued daily and drunk in presence of an officer, yet scurvy broke out, and Parry tells us that this was undoubtedly due to the damp between decks. One of the most eminent among Arctic medical officers is clearly of opinion that the first cause of the outbreak was the debilitating effect upon the constitution caused by the absence of light. Another cause was, he considers, the extreme and prolonged cold to which the men were exposed. As lime-juice was regularly administered, it is quite certain that the want of it was not the cause of the outbreak of scurvy; and there were cases of scurvy among men who never went away sledging, both in the 'Alert' and the 'Discovery.'

We now come to the second comparison, as regards the sledge-travelling. For this purpose we will take the 'Resolute' in 1853, as she was the ship on board of which Captain Nares acquired his experience in Arctic work. No lime-juice was taken on the sledges of the 'Resolute.'* The diet of the travelling parties of the 'Resolute' and 'Alert' was identical, and the weights were nearly the same. The scurvy did not attack the 'Resolutes,' while the 'Alerts' were disabled by it. No lime juice (with the exception of four quarts in the northern division of 1876) was taken in either case. This is a conclusive proof that the absence of lime-juice on the sledges of the 'Alert' was not the cause of the outbreak of scurvy.

* The misrepresentations of the *Times* on this point have been fully exposed by Dr. Scott, the Surgeon of the 'Intrepid,' and by Admiral Richards.



THE ARCTIC REGIONS

180°
165°
150°
135°
120°
105°
90
75°
60°
45°
30°
15°
0°
Long. West from Greenwich
Long. East from Greenwich
NORTH POLE
85°
80°
75°
70°
65°
Arctic Circle
BERING SEA
St Matthew
St Lawrence
Anadyr G.
Anadyrsk
Stanovoi Mts
Chukchi
Yukaghirs
Kolymsk
Verkhne Kolymsk
Nizhni Kolymsk
Yakutsk
Lena R.
Yana R.
Olenek R.
Viluisk
Shiganesk
Krasnoyarsk
Yenisei R.
TAIMYR P.
C. Cheluskin
C. Thaimyr
Turukhansk
Tas
Obdorsk
Samarovsk
Hereza
Yalmal (Samoyed) Pe
KARA SEA
Waygats I.
Nova Zembla
Barents I.
Gillis I.
Wiche (Karl) Ld
SPITZBERGEN
BARENTS SEA
GREENLAND SEA
Hecla & Griper B.
Beechey I.
Parry Is.
Melville I.
Banks Ld
Banks Str.
Pr. Patrick I.
Pr. Albert Ld
Victoria Ld
Melville Ld
Wollaston Ld
Prince of Wales I.
Cornwall
Queen's Chan.
Fox Chan.
Fox Ld
Southampton I.
Melville Pen.
Hudson Str.
HUDSON BAY
LABRADOR
BAFFIN LAND
BAFFIN BAY
Melville B.
Shackleton
Davis Str.
Disko
Godhavn
Resolution I.
Upernivik
Holsteinb.
Goodhaab
Frederikshaab
Lichtenau
Fareswell
GREENLAND
Denmark Str.
ICELAND
Reykjavik
Skyddisholm
Hecla
Hengest
Jan Mayen
Shannon I.
Cape Mary
Cape Yorke
Cape Barrow
Wrangel I.
Herald I.
Whitney I.
Lisburn Pt.
Point Hope
Icy C.
Kotzebue Sd
Selawik L.
Kowak R.
Kobuk R.
Kuchpuk (Lootschoux)
Mackenzie R.
Richards I.
C. Bathurst
Kellett Pt.
Liverpool Bay
Prince of Wales Str.
Barrow Str.
Lancaster Sd
Jones Sd
Smith Sd
Kennaye (Thatlaina)
Yukon
Selkirk
Pelly Banks
McKenzie R.
Mt. Elias 19070
Behring Str.
Kamenoi C.
Siberia C.
Lubenok
Petersburg
Archangelsk
Dwina
Onega
Kem
Mezen
Pustozersk
Pechora
Belgouev I.
Kola
Tornea
Wardhus
Hammerfest
North C.
Sandness
Lofoden
Drontheim
Christiansund
Bergen
Stockholm
Upsala
Abo
Helsingfors
Wiborg
Revel
Riga
Memel
Dantzic
Konigsberg
Stettin
Copenhagen
Gothenburg
Christiania
Stockholm
Upsala
Abo
Helsingfors
Wiborg
Revel
Riga
Memel
Dantzic
Konigsberg
Stettin
Copenhagen
Gothenburg
Christiania
Shetlands
Faro Oer
Bergen
Christiansund
Drontheim
Lofoden
Hammerfest
Tornea
Wardhus
Kola
Archangelsk
Dwina
Onega
Kem
Mezen
Pustozersk
Pechora
Belgouev I.
Petersburg
Lubenok
Siberia C.
Kamenoi C.
Behring Str.
Mt. Elias 19070
Selkirk
Pelly Banks
Yukon
Kennaye (Thatlaina)
Kuchpuk (Lootschoux)
Mackenzie R.
Richards I.
C. Bathurst
Kellett Pt.
Liverpool Bay
Prince of Wales Str.
Barrow Str.
Lancaster Sd
Jones Sd
Smith Sd
Cape Barrow
Herald I.
Whitney I.
Wrangel I.
Lisburn Pt.
Point Hope
Icy C.
Kotzebue Sd
Selawik L.
Kowak R.
Kobuk R.
Cape Yorke
Liakhov I.
N. Siberian I.
Bulkur
Kotelnoi
Ost Olenek
Olenek
St Peter
Cape Yorke
Cape Mary
Shannon I.
Beechey I.
Parry Is.
Melville I.
Wollaston Ld
Prince of Wales I.
Cornwall
Queen's Chan.
Fox Chan.
Fox Ld
Southampton I.
Melville Pen.
Hudson Str.
Melville B.
Shackleton
Upernivik
Disko
Godhavn
Resolution I.
Holsteinb.
Goodhaab
Frederikshaab
Lichtenau
Fareswell
Jan Mayen
Hecla
Hengest
Skyddisholm
Reykjavik
Arctic Circle
Denmark Str.
ICELAND
Faro Oer
Shetlands
Gillis I.
Wiche (Karl) Ld
Waygats I.
Nova Zembla
Barents I.
Yalmal (Samoyed) Pe
KARA SEA
Obdorsk
Samarovsk
Hereza
Turukhansk
Tas
Yenisei R.
TAIMYR P.
C. Cheluskin
C. Thaimyr
Yana R.
Olenek R.
Viluisk
Shiganesk
Krasnoyarsk
Yakutsk
Lena R.
Nizhni Kolymsk
Verkhne Kolymsk
Kolymsk
Chukchi
Yukaghirs
Stanovoi Mts
Anadyrsk
Anadyr G.
St Lawrence
St Matthew
BERING SEA
PALAEOCRYSTIC SEA
Wrangel I.
Herald I.
Whitney I.
Cape Barrow
Lisburn Pt.
Point Hope
Icy C.
Kotzebue Sd
Selawik L.
Kowak R.
Kobuk R.
Kuchpuk (Lootschoux)
Mackenzie R.
Richards I.
C. Bathurst
Kellett Pt.
Liverpool Bay
Prince of Wales Str.
Barrow Str.
Lancaster Sd
Jones Sd
Smith Sd
Kennaye (Thatlaina)
Yukon
Selkirk
Pelly Banks
Mt. Elias 19070
Behring Str.
Kamenoi C.
Siberia C.
Lubenok
Petersburg
Archangelsk
Dwina
Onega
Kem
Mezen
Pustozersk
Pechora
Belgouev I.
Kola
Tornea
Wardhus
Hammerfest
North C.
Sandness
Lofoden
Drontheim
Christiansund
Bergen

The greatest amount of experience in sledge-travelling was acquired in 1853; and the precedents of the 'Resolute' were carefully followed in 1876. Yet in 1876 the scurvy broke out a few days after the men left the ship, those men having taken regular daily allowances of lime-juice for nearly a year. The cause must be attributed to the protracted cold, damp, and darkness they had endured for a period half as long again as that during which the men of the 'Resolute' were exposed to those influences; moreover, they had only enjoyed the restoring effects of the returned sun for one month before starting, while the 'Resolutes' enjoyed its influence for two months before they set out. These are the only differences between the two cases, and therefore the only reasons which can account for the fact of the disease attacking the travellers of 1876 and not those of 1853, the conditions affecting both being identical in every other respect.

No means were furnished to the Expedition for using lime-juice on the sledging parties, during the extreme cold of April and May. At a temperature of 20° to 40° below zero the lime-juice, in bottle or jars, becomes a solid mass, while the process of freezing separates its component parts. The strong acids are precipitated, and the bulk is a mass of watery refuse. Consequently the whole volume must be thawed and mixed again, every time it is used. This, of course, is impossible when bottles or jars are taken, as they would crack in the thawing process, and no other receptacles for the lime-juice were supplied to the Expedition. Lime-juice could not have been usefully taken on the sledges even if it had been necessary. But the experience of the 'Resolute' had conclusively proved that this was not the case.

The most important point to consider is the means of avoiding a similar outbreak of scurvy in future expeditions. We have learnt by experience that there is a great difference between the Polar Regions north of 82° and the Arctic Regions where former expeditions wintered, owing to the greater length of the winter nearer the Pole. In the far north the men are inevitably exposed, for a much longer time, to the predisposing causes of scurvy, extreme cold, damp, and long darkness. Dr. Woodward, in his "Report on the Camp Diseases of the United States Army," enumerates, among the determining causes of scurvy, excessive fatigue, want of exercise or its converse, cold, moisture, and bad ventilation. In the "Medical History of the British Army in the Crimean War," sameness of diet is added as a cause of scurvy.

When an expedition is to pass an Arctic winter which is much longer than any previously experienced, additional care must be taken in supplying as much vegetable diet as possible, and in securing greater variety. Condensed milk ought to be issued to all the men, and should not be confined to the sick, as well as egg-powder in abundance. There should be several additional sorts of preserved vegetables and fruits, for it is very important to vary the diet in every possible way. It is absurd to talk about taking lime-juice on the sledges, except in the summer months, but another vegetable might be added to the preserved potatoes. The chief point, however, is not to start until the sun has returned for full two months, and it is also clear that the sledging journeys must be shorter in proportion as the winter darkness has been longer and more severe. In the late Expedition the mistake was that the explorers attempted, under far more disadvantageous conditions, to do as much as could safely be undertaken by their predecessors further south. It was a noble and glorious mistake; and to it is due the rich harvest of valuable results with which the Expedition returned.

XIII.

THE WELCOME HOME.

THE vast and enthusiastic crowd which witnessed the departure of the 'Alert' and 'Discovery' from Portsmouth, on the 29th of May, 1875, formed a sight which will not soon be forgotten by those who heard the ringing cheers resounding over the harbour, and saw the densely-packed mass, with the thin red line passing through it. This sympathing crowd represented the feeling of the whole people of England. The despatch of the Arctic Expedition was a great and wise measure, which received the complete and hearty approval of the nation. Nor was the feeling transitory. No word was heard of the absent explorers for fifteen long months, but they were not forgotten; and when the glad tidings of their safe return, after doing all that was expected from them, and doing it well, was received in England, their countrymen were proud of their achievements, and prepared to give them a hearty welcome.

On the 2nd of November the two ships, much battered by the ice, with several boats missing, and other signs of rough usage, returned to Portsmouth Harbour; and once more a vast crowd assembled on the Common, and densely lined the beach, from Southsea Castle to the Dockyard Gates. Again the ringing cheers resounded from the shore, and were echoed back from the yards of the 'St. Vincent' and 'Duke of Wellington.' For the men who had gone forth a year and a-half before were returning to their homes, after having gloriously upheld the honour of their profession in a deadly and unequal struggle with the powers of nature. In spite of hardships and privations, of obstacles and difficulties, in spite even of scurvy, they had persisted in the steady performance of their duty until their work was done. They had planted the British flag on the most northern point ever reached by any human being; and returned with rich and fruitful results which have largely increased the sum of our knowledge. With good reason their welcome was warm and enthusiastic.

The careful perusal of the reports on the work done by the Arctic Expedition increased rather than diminished the feeling of congratulation that spread from England over the whole civilised world. The prompt recognition of the value of the services of the Arctic officers and men by Her Majesty and by the Admiralty was followed by the usual promotions; while the importance of the scientific results of the Expedition, and of its geographical discoveries, was, after careful consideration, most fully recognized in letters to Captain Nares, by the President and Council of the Royal Geographical Society, and by the Presidents of the Geographical Societies of France, America, Germany, and Austria. The Navy, with one voice, heartily and

warmly acknowledged the gallantry with which its fame had been upheld in the Polar Seas. This feeling found expression in banquets given to the Arctic officers by the First Lord of the Admiralty, the United Service Club, the Naval Club at Portsmouth, the officers of the Royal Naval College at Greenwich, and the Officers of H.M.S. 'Excellent.'

But these dinners of welcome were not confined to the Navy, and the number of invitations exceeds anything that could have been expected. The truth is that there was a special reason for the invitations from several important bodies unconnected with geography or with the Navy. Some portion of the Press raised a cry of detraction, which was echoed by a yelping pack of ignorant critics. This gave rise to a strong feeling of indignation among the public, and was the direct cause of several banquets being given or proposed to the Arctic officers, which otherwise would not have been thought of. The attacks of an obscure portion of the Press had a very different effect from what was intended. We owe an apology to our readers for alluding to such garbage, but it seemed desirable to place on record the cause which led to invitations from at least some of the public bodies which have entertained the gallant explorers.

There was one reception which requires special notice. The only competent judges of the way in which officers and men of the late Arctic Expedition performed the task assigned to them are the veterans who served in former expeditions. If they are satisfied that the work was done well, it matters nothing what any other man may think. Their voices are unanimous, all uniting to approve most cordially of the achievements of their young successors. So that the dinner given by the old Arctics to the 'Alert' and 'Discovery' is by far the most significant of all the numerous recognitions they have received. It took place at Willis's Rooms, at 7 P.M., on Wednesday, the 6th of December.

It was more than seventeen years since the old Arctics had assembled at a social gathering. On the 5th of October, 1859, they gave a dinner to welcome home McClintock and the officers of the 'Fox.' On that occasion, as many as twenty-two old Arctic officers assembled from far and near. Dear old Sir Horatio Austin was in the chair, and he was supported by Captains Sir Edward Belcher, Bird, Collinson, Haswell, Sherard Osborn, Forsyth, and Jenkins; by Commanders Cator, Trollope, Hamilton, and May; by Lieutenants Nares, Murray Parks, Alston, Cheyne, and Meara; Doctors McCormick, King, and Ede; Mr. Allen, Mr. Biggs, and Mr. Clements Markham. Since then there has been a long interval, and the ranks are sadly thinned. Sir Horatio Austin is gone, and alas! Sherard Osborn, the originator and promoter of the Expedition, is lost to us. Yet such was the strength of the feeling that Nares and his officers and men were worthy successors in Arctic work, that the older officers again came up from far and near, many from remote parts of the kingdom, to do them honour. There assembled as many as twenty-eight old Arctics, an extraordinary number considering the length of time that had elapsed since they were serving within the frozen zone.

Sir George Back, the father of Arctic officers, who commenced his service in those regions fifty-eight years ago, was in the chair. There too were Sir Richard Collinson, who passed three winters in the ice, in command of the 'Enterprise;' Ommanney, the captain of the 'Assistance,' in 1850-51, with four of his officers, McClintock, the First Lieutenant, Vesey Hamilton, then a mate, Clements Markham, a midshipman, and Dr. Ede, the Assistant-Surgeon; Inglefield, who commanded the 'Isabella' and 'Phœnix,' with his officers Hills and Meara; and Jenkins of the 'Talbot.' The 'Investigator' was represented by Haswell, her old First Lieutenant, and the last survivor among the executives. Captain Austin's ship, the 'Resolute,' in 1850-51, mustered Robert Aldrich her First Lieutenant, Robert C. Allen her Master, and May and Cheyne who were then mates. Besides McClintock, the Expedition of Sir James Ross in 1848-49 was represented by Moore and Biggs. The Expedition of 1852-54, besides McClintock, Hamilton, May, and Cheyne, included Richards, Roche, Jenkins, Dr. Lyall, Dr. Toms, and Dr. Scott. The 'Herald' and 'Plover' mustered G. H. Allen, Hull, and Whiffin; and Allen Young represented the 'Fox.' John Barrow, the old and tried friend of Arctic men, was also there.

Sir George Nares, as an old Arctic, was a mate in the 'Resolute' in 1852-54. As a young Arctic he was Captain of the 'Alert.' He forms the connecting link which ties together the older and the younger generation. With him were Stephenson and Markham; Aldrich, Beaumont, and Parr; Giffard, May, Archer, Rawson, Fulford, Egerton, and Conybeare; Colan, Ninnis, Coppinger, and Feilden; Mitchell, Cartmel, White, Miller, and Hodson; and Pirie of the 'Pandora.'

Thus, probably for the last time, a great gathering of old and young Arctic officers sat down together. Their united experiences spanned over a period of 58 years, and included almost every portion of the Arctic regions. Old and young alternated round the table, reviving old memories and associations on the one hand, and hearing the details of the work, based on their traditions, which their young successors had so recently achieved on the other. There was a complete interchange of feelings and experiences, a warm and cordial amalgamation, and amidst most interesting conversation, young and old Arctics became one brotherhood. When Sir George Back rose to deliver his eloquent and admirably conceived speech, the fusion was complete. He spoke of the difficulties of the work, of the valuable results, of the ability, tenacity of purpose, and gallantry of the young explorers, and when he concluded, such rounds and rounds of British cheers were sent forth as left no doubt of the verdict of the old Arctics. They have pronounced their opinion emphatically. The young Arctics who are now to the fore—Ready, ay, ready—are their worthy successors.

That it may not be long before fresh opportunities are offered to them to repeat their former brave and gallant deeds, by a renewal of Arctic exploration in a new direction, is the hearty desire of their Arctic brethren, of the Navy, of geographers, and of all true Englishmen who regard the honour and welfare of their country.

SKETCHES OF LIFE IN GREENLAND.

V.

THE MORAVIANS.

BEING aware that I have more than once mentioned the Germans, I think it is time to enlighten you further about them. "The Germans" was the term in daily conversation applied to the Moravian missionaries alike, whether they happened to be from Switzerland, Prussia, or some Danish province; Germans we also called the Greenlanders belonging to their congregation. Their place, situated to the left of our colony, was called New-Herrnhut, as already mentioned. We were on very friendly terms with the missionaries, and often on holidays we visited them in large parties, but most frequently the ladies of Godthaab called alone with their children, and often returned much benefited by some piece of domestic advice from the well-informed elderly missionary-wives. I liked all the Moravians very well, and the becoming cap of the ladies made a favourable impression on my young heart. Some time elapsed before we ventured to become familiar with them, yet, by and by, we got on pretty equal terms, probably partly because of the return to Europe of the elderly people, who were succeeded by younger and less grave ones. But with the modern people, alas! the bewitching little headgear soon vanished, and was only seen on holidays and church occasions. The time generally chosen for these excursions was directly after our early dinner—I think what you call in England "after lunch."

We could reach New-Herrnhut by different ways, one leading across the hills to the left of Godthaab, the other through the valley; and, finally, the third path was seawards, round Cape Noûk, but by this one we very seldom went. In the summer, and when going in larger parties, we, at the same time, delighted in the beautiful walk, and we then used to stroll slowly along the vale-road, first crossing a little moor, across which some unknown philanthropist had thrown a row of very uncomfortable stepping-stones, that could, of course, only be passed by one person at a time. When happily landed on the dry heather, we sauntered along the eastern hills, the children, in the happy feeling of liberty, always running in front, and, like little dogs, making the distance twice as long as necessary. We often stopped either to look for a flower, or to catch some sounds from the distance, or to make out who the lonely hunters were coming down the hills yonder; sometimes we did not go straight on, but made a round to the Devil's Cleft, to try the echo there. But let us rather leave it behind now and continue the right way; we glance at the brown "Malenes" to our left, and the lofty glacier of the Antlers, and then again look back for the children who were bringing up the rear. The nurses are seen standing upright, but the urchins are all down on their faces to drink of a rivulet, whose clear waters did not so much excite their thirst as their fancy for indulging in a national custom: our children quite delighted in aping all the Greenland customs, of speech, manners, and gait; the boys acting the part of young kayakers and huntsmen, by imitating their gestures and using the terms peculiar to them; the girls adopting little coquettish ways of the most fashionable young females (if you fancy the Greenland girls quite artless, you are greatly mistaken). In the meantime, as we have not yet entered the house of the Moravians, let us rather return to the colony, and consider this promenade as an every-day's walk in our own environs.

In spring it always was most alluring to me to cross over to New-Herrnhut, because of its being next to impossible for me to remain in the house on a spring day, when all nature seemed to awake after the long winter rest. On such days I could do no work; and having paced the "Langelinie" for hours, I at length used to get ashamed of letting the colony see how idle I was; but indoors I could not stay, so I took the mountain-path to Germany, the valley being impassable, because of the deep snow melting and forming a perfect deluge there. It was, however, difficult enough on the rocks, but as the Greenlanders were all active at that time coming and going, I considered myself quite able to do the same. On the hills it was all very well, but before reaching the house one had to cross part of the plain and that might be impassable. But enough! I succeeded, and was admired by, and rewarded with the hearty welcomes of, the missionaries, who regaled me with coffee and cakes, and their wives supplied me with dry boots and stockings, whilst mine were being dried in the nursery—a separate house in the Greenland fashion, where all the servants of the brethren live as sisters: how sisterly I cannot say! I did not stay there long, though the inviting comfort and snugness of their little parlour, filled with the scent of the blooming gillyflowers in the windows, was not a little tempting. I got as wet as before on my way home, but it is no sacrifice on such days in Greenland to spoil several pairs of boots. Oh, the gentle spring! how I welcomed it, though no tree was budding. (I never missed the trees.) The snowbare mountain-tops with the innocent, sometimes very scanty, flowers, the delightful sunshine on the calm ocean always spread before us, the harmonious sounds of the falls and streams bursting their wintry confines, the fresh grass peeping through the last remnants, even the yellow oasis with the withered straw from last year, are all to me alike lovely substitutes for richer verdure and vegetation—all alike proclaiming the omnipotent, all-loving Providence.

It is spring-time now here in Denmark; and as I sit recalling the Greenland spring in general, and that day here alluded to in particular, to my mind, I am disturbed by the cries of our fish man, and a woman with shrimps, who are trying to outdo each other, one would think; and I wonder whether at some future day, the spell of bygone days will ever be able to draw a magic circle round this recollection, as is the case when I now look back on my kayak fishermen in the Gulf of Godthaab? I cannot easily fancy that. I sit down to have a look at the beautiful view of the sunny gulf with these national characteristics, and the swarms of noisy spring birds. From the Northland opposite I hear an incessant shooting going on, for it is just now the time when the eider-ducks migrate; they are caught in abundance by the young men, who at this season leave early in the morning for the Northland and other places, to return in the evening with rich prizes. We shall meet them on Langelinie on our evening promenade, and, for instance, ask "*Kasserarp it Epha?*—How many have you got to-day Ephraim?" "I have only got six,

but Cali has been more fortunate and has got thirty;" adding, "Do you want some?" "Oh, yes, thanks, could you spare me a couple?" Epha was the son of our cook, and they were both very attentive in offering us national provisions.

But I have digressed too far from my main subject, for I have decided upon making the regular Moravian tour on a winter-day, only I am unable to prevent myself from still returning to the dawning spring. Let me just peep inside our garden, where our children, with some Greenland playmates, are playing summer games, building houses of our window shutters, and furnishing them with part of their toys—Greenland fashion, of course; again let me listen to the rippling sounds in the moss, to the chirping of the graceful little snow-bird and the "kousagtak," both pass-birds of the spring—listen to the welcome tumbling noise of the lavines in the thaw sliding down the roofs; let me give a nod to some passing-by deformities with their faces and upper part of their bodies hidden, not exactly by the forest of Birnam, but something in the same style—women nearly invisible through the immense bunches of heather and branches they were carrying on their back!—and let me still give a nod to Mads, not the young husband mentioned in a former chapter, no! old Mads, the kind patriarch of our goats. Even the flock comes down the road looking still a little drowsy from their long confinement in the stable, and having some trouble in wading through the soft snow. After this I shall at once transform the aspect of Godthaab and New-Herrnhut to that of winter, though rather unwillingly, I confess. Say on a day in February.

When a trip to Germany was decided upon, the first step was to send a message to the cottages of the nurses, if they were not present, to let them know our plans; then they would soon reappear smartened up with new boots and smartly arranged handkerchief round the forehead, waving coloured ribbons, and bows over the upper part of their boots, and red cuffs drawn over their small hands; and, accustomed as they were to these expeditions, they attired the children to their own taste with new aprons, dressed their hair a little, and if in winter, as to-day, put on their skin clothes and gloves. In fancy, I see many a dear face of our several servants, but I let the before-mentioned Louise, our old acquaintance from the country-trip in the Kangerdluarsuk, maintain her place in our service. (She is now married to a young man from Godthaab; they call him Arkaluk; he is the sole printer in Greenland, having been taught this art in Copenhagen; and Louise is still, it is said, a pretty woman, though she now has four children. The day she called to see me, Mrs. I—, the clergyman's wife, with her children and sister-in-law were waiting outside. She certainly was a very pretty girl. Her father was a Dane, the old captain of the Godthaab yacht; her mother the stout Ane Kattra, whose father also had been a Dane. The nurse of the minister's children was Juliana—Nona the little ones called her; she was a nice girl too, but quite a different style from Louise; she was the sister of Arkaluk, so at present sister-in-law of her former fellow-servant and friend.)

So we started; but first we had a little consultation as to the road we should take. "*Sukkut ingerdlassavise?*—Which way?" asked the girls. We knew before that they themselves preferred the mountain-road, so we also gave it the preference. Down the colony road we went to the first rather steep ascent, after which the road was quite even and smooth across the tops until it descended to the level where the great triangular building of the Moravians was situated—the red wing with the white chimneys, and the black wing with the belfry. Of course we had not chosen a really bad day for our excursion, but still it was far from being a fine day; it was cold and windy, and the last still unfrozen snow-waves were slowly undulating before the east wind, and carried into the real sea below. The garden of the missionaries, at other times green, now lay deep buried in the snow; hungry ravens—after the usual tourist style, they ought to be ragged and setting up dismal croakings, but my ravens shall be in conformity with truth, smooth-coated, glistening black, but hungry. I cannot deny they must have been a little unhappy, to judge from the restless way they were flapping their wings, hopping to and fro, up and down, in the hope of finding some remnants on the dunghills. Everywhere you turn your eyes you see no other colours than black and white; the sky and the sea on this day hardly excepted, the heavens being cloudy and the sea very dark blue. To complete the wintry aspect, I must mention the half-open courtyard of the Moravians, with the sun casting its very feeble rays on the splendid but thoroughly wintry icicles hanging down from the roof perfectly dry; a beggarly-looking old frogfish fisher, probably as hungry as the ravens, is crossing the place on his way to his very humble turf cottage, that is as dear to him as a marble castle.

But let us have a look at the same place on a summer day: the same sun is sending other rays, that have thawed away not only the icicles, but make the tar trickle down from the roof and fall to earth in drops, to the immense joy of the urchins who are always haunting these precincts, always tolerated, although not always wished for; the ravens, of course, have disappeared—the garden awakened to new life after its long slumbers; instead of the icy beach, the rocky beach with its myriads of pebbles; instead of the dark blue ruffled sea, there is the light blue sea, with the gay kayaking life going on. But winter it now is, and the sharp bite of the east wind makes us bury our heads in our furs, as did the old frogfish fisher, though we being so much better off than he, as we are soon to sit down snugly to some warm drink. There we are at length, seated on the long sofa of seal-leather, with the plain little table before us spread with the whitest of cloths.

With the president of the missionaries we stopped oftenest. He was a very talkative man, Mr. H—, who knew well how to entertain his guests; he had travelled a good deal in his younger days, and had a lively temperament and a good memory. The rooms—the little low rooms I liked so very much, furnished as they were in the simplest of styles, with the plainest of furniture, and little pictures of German towns with gay green gardens and many-coloured houses. Under the diminutive looking-glass between the small windows hung the scripture text, "*Sei still und warte des Herrn*," glazed and framed. At first sight, childlike as I was, I regarded it with about the same awe as I did the ladies' "caps," but not as in any way concerning myself; but later on I came to look at it with other feelings, and considered it a nice and profitable

custom to have such a visible monitor. On the whole, there was in these little rooms much to excite my fancy: Mr. H— also possessed a little collection of steel engravings, called "the little universe," and this led the enthusiastic travelling spirits all over the globe: from St. Paul's across to St. Peter's, and from Venice to Genazareth; and I always delighted in making the journey. Mrs. H— brought the coffee. The children, radiant with delight, were placed at the children's table, spread with cakes and the holiday playthings of the German children; and afterwards they always had a cornet, with sweets which the father drew forth amidst great glee and exultation from sundry nooks and corners in the room, from little secret places in the cupboard, and from drawers in the likewise red-painted beams of the ceiling. When tired of being indoors, the children ran to play at "hide and seek" in the church—"*der Saal*" they called it; this was as dull and dreary a room as their habitations, on the other hand, looked cheerful. There were some very primitive benches for the congregation, a plain little table for the missionary when he officiated; finally, an organ and some old bassoons, whose out-of-tune sounds the charm of memory changes into sweetest harmony, as I write this down. We were surprised that the Moravians, otherwise so devout, used their "*Saal*" thus ordinarily; the children, however, enjoyed their privilege unscrupulously, till they were called away to be dressed. The nurses also were sent for at the servants' house, and sent off with them in front,

Towards evening the east wind often abates. We had to-day looked forward to that possibility, and we were not disappointed. After many thanks, requests to come again soon, which were returned in like manner by us, we took leave, and ascended the hills in high spirits, as usual. The heavens were quite serene and calm; nothing but the dark sea reminded us that there had been any wind; the church-bell for evening prayers at the Moravians reached us the moment we prepared for the descending to our own parts; and once more I have a picture of peace before my mind's eye. Twilight had come on, and the light shone out from many houses, and from above the mild stars looked down on our little illuminated town. The colony was still all astir: young people running up and down the flagstaff-hill, to try and form an idea of what the wind and weather was going to be on the morrow; some Europeans take their evening's walk, the colonists stand smoking their clay-pipes in front of their houses, and the imperturbable "*neviarsiats*"—young maidens—were promenading, psalm-book in hand, probably keeping time to the tune of some lively "*arfenik pingasut*," a species of Scotch reel (their favourite dance).

Our children, who had had the advantage of the start, came running to meet their "*ananas*" (mothers); and, a little tired, we now sauntered to our houses in the uppermost part of the colony; near our house we took leave of the clergyman's ladies, and after having spoken a few words with Elisaus, whom we met coming from his evening's visit to the stable, we also entered. The constant topics of Elisaus and myself were milk, meat, and other culinary points; but to-night we all admired and wondered at the distant golden streak over the dark blue sea, and the Cook Islands on the horizon. S. N. R.

INTERNATIONAL EXPLORATION OF AFRICA.

THE SHARE OF PORTUGAL.

(From the "Journal de Commercii," No. 6904, of the 11th November, 1876.)

THE general outline of the course to be pursued by our Government in this proposed expedition has been already given with that good sense and completeness characteristic of the efficient Secretary of the Geographical Society of Lisbon. On this point there is nothing to add. We will therefore confine ourselves to what suggests itself to us from the practical standpoint we occupy.

By a glance at any map of Africa it is apparent that the rivers running furthest into the interior towards the north and south limits of our two principal possessions on the two coasts, Angola and Mozambique, are: on the one side the Quanza and Cunene, and on its northern extremity the Zaire, and on the other side the Zambese. The vast region extending between these two widely distant limits, replete with natural riches can, by means of those large arteries, be brought into communication with the outside world, and be made to receive in exchange for its ivory, its gold, and all the other raw materials with which it abounds, the produce of European industry, and the light of civilisation it now lacks. Rivers and navigable canals are the cheapest as they are the most convenient communications in all countries, and they are therefore the ones that should be first utilised.

The Zambese has already been explored throughout a large portion of its course. Livingstone's journal will be a valuable guide for any further explorations. On this side the route to be followed is already laid down. What we have now to do is to profit by the work that has been already done to complete what is wanting, and to carry out effectively whatever we propose to do. Starting from the Zambese by its principal affluents on either side, we must, by successive marches, arrive at a knowledge of the country through which they pass, and go on establishing posts or commercial centres wherever they may be most convenient. We shall thus advance from station to station, ever gaining fresh ground, while at the same time we should penetrate into the interior until we reach the Chobe, the Longo, and the other confluents to the west of the Zambese. The first, and the one that appears to be the most important, would conduct us to the neighbourhood of the Quanza, and to within a relatively short distance of the Cunene.

This projected exploration must, however, necessarily be harmonised with whatever plan may be decided on for the western region on the Angola side. On this side there are two routes open to us to follow, that of the Quanza and that of the Cunene. The Quanza is perfectly well-known up to east of Pungo Andungo; some steamers plying on its waters carry on a regular service for the transport of goods between some of its inland waters and Angola. It is only now necessary to explore its upper course, where it is almost entirely unknown. The Cunene is only known at its mouth and between Humbe or Dongoena, and Hunga in the interior, as far as Mullondo. If we were to be told that it was intended to carry out the explorations of these two rivers simultaneously, we

should have no objection to urge, but still it appears to us rather too much for a Society to undertake, which is still quite in its infancy.

The Quanza is known and navigated throughout the largest or best part of its course, and already renders important aid to commerce and agriculture in that region. The Cunene may be made to do a similar service, if it is explored, at least as far as Humbe, that being the point where its exploration was abandoned, although the Government has since then ordered it to be continued.

The Quanza is at its source in close proximity to the Cubango, or the river to which this name is given, and which is supposed to be a confluent of the Zambese, and it may be possible at this point to get an inland communication with this latter river. This may also be done, even under more favourable conditions, with the Cunene. For example, the region in which the sources of these two or three rivers are met with is an extremely mountainous one, and inhabited by natives of a rough and turbulent disposition, and communication there would be always difficult. On the Cunene side, however, such communication could be made much further to the south, thus avoiding these disadvantages, both as regards the mountains and the warlike proclivities of the natives. But that which decides the preference to be given to the exploration of the Cunene, above all else, is the fact we first noticed.

The Cunene, which is the natural channel of communication between the vast and rich regions of the interior of Mossamedes, runs from its mouth up to Humbe through a most fertile and healthy country, where European agricultural settlements might be formed, a fact which gives it a special importance, and one that has hitherto been overlooked. The Cunene has not a very accessible bar, neither has it a safe port for vessels proceeding there. But at a distance of about 6 or 7 leagues to the north there is the ample and magnificent "Tigres" Bay; and a road between these two points would remedy everything. With the occupation of the Cunene, the establishment of the district capital of Mossamedes would follow there in a short time. The distance from the mouth of the Cunene to Humbe is at most 60 leagues; from the town of Mossamedes, by the way now used, it is from 90 to 100. It is possible some obstructions may be met with, such as cataracts or rapids (the Zambese has some), in some point or other in the stream of the Cunene; but it is also probable that in the rainy season, when there is more water, those obstacles would be so far covered as to offer little difficulty to navigation: but given the existence of these, the remedy would still be very easy by breaking the navigation at such points, and continuing it higher up, as is done in other parts under similar circumstances. From the mouth of the Cunene as far as Humbe, the country inhabited by the Muximbas or Baximbas would have to be crossed. These people are very intractable, but at the same time not very aggressive. They were expelled by the English, more south, from the neighbourhood of Walvisch Bay, without much difficulty.

The first inhabited parts met with on the banks of the Cunene, before reaching Humbe, are Dongoena and Hunga; thence, or even a few leagues before it to beyond Mullondo, the Cunene runs through a fertile and inhabited plain, covered with trees, and on the river banks is most beautiful. From Humbe towards the interior in an approximate S.E. course, and for a distance of about 100 leagues through tracts already formed—which could be shortened to a little over 70 as soon as it became possible to follow a shorter course—the river known there as the Cubango is met with, which from Quangari, the first land it crosses on its right bank, runs in an E.S.E. direction as far as Mucusso or Bocusso (it is also called Xiloto), the extreme point on the same side of the river to which the black travellers from Benguella or Mossamedes come (that is, from the inland points of Quillengues, Gambos or Humbe), who go there to buy ivory.

The journey from Quangari to the Mucusso in day stages is as follows:—From Quangari to Bunja, two days; from Bunja to Sambio, two days; from Sambio to Derico, two and a-half days; from Derico to Mucusso, three days. A day's journey may be reckoned at 6 to 7 leagues. As we have to add to these distances the spaces occupied by the lands just mentioned, the total distance from Quangari to Mucusso may be calculated at 65 to 70 leagues very nearly. The Cubango, in passing through Mucusso, is so large a river that various islets or aits are met with in it, on some of which the "soba" and other members of his family reside.

Beyond Cubango in an easterly course, and three days' journey from Mucusso, is situated the Gange country, inhabited by a brave and warlike people, whose soba or chief, Xiquerete, in 1858, invaded the lands of Mucusso as far as Quangari with a large following, laying waste and destroying everything. The inhabitants of Mucusso give these people of Genge the name of Makakolos, probably the same people Livingstone calls the Makalolos. On the hither side of Mucusso, and towards the S.E., are to be found the Mundembendes, a very numerous nomad people, who render a certain homage to the soba of Mucusso.

We will now explain the doubts we entertain as to the identity of the River Cubango. Livingstone, in the maps accompanying the book containing his first travels into the interior of Africa from 1840 to 1856, gives the name Cubango to a river which, rising in the same mountainous region in which the Quanza rises, but running in an opposite direction, afterwards takes the name of Coquema, with which it enters the Chobe. In a parallel course, but separated from it to the south by about 40 leagues, Livingstone gives us another river, the Embara (Embarrach he wrote in his book), which discharges into Lake Ngami. Between these two he makes the River Cuanamare to run, which discharges into the Coquema.

It should be noted that Livingstone places the Derico (Darico he called it) on the right bank of the Coquema, a little above where it receives the Cuanamare; if this particular be correct, Mucusso should be found distant only a three days' journey or about 18 to 20 leagues to the S. or S.E. of Derico. Instead of this we find Mucusso shown on the banks of the Embara 40 leagues distant. Mucusso is indicated by the collective name of "Balibebes," which means those of Libebe or people of Libebe, such being the name of the "soba" of Mucusso, when Livingstone passed within a certain distance of those places, and which we ourselves found to be some 80 leagues

distant towards the interior of Mossammedes. Which of these two notes is correct, that of Derico or that of Mucusso? It may be neither, but if it is the first, the opinion of those who consider the Cubango to be the Coquema or Chobe is correct. If it is the second, then the Cubango is the Embara. In the map of Angola, compiled by the Marques de Sa da Bandeira and Lieut.-Colonel Leal in 1853, it is seen that the first hypothesis is the one there accepted. We hesitate. From information obtained of black travellers who have gone to Mucusso, we should be inclined to believe that the Cubango is the Embara. But Livingstone says that the Embara is dry except at the rainy season, which prevents our holding to this conjecture. And the Cuanamare? May not this, perhaps, still be the river called the Cubango. The existing data respecting all these are so uncertain, and all that is known about them is so obscure, that the latter hypothesis could scarcely be rejected. The direction and situation of the River Cubango, in the map already referred to, do not merit much confidence, and it is also seen that the distances are not correct, as may be verified, for example, between the Quangari and Mucusso. At all events, starting from Mumbe towards the east, with more or less southing, the rivers forming the upper course of the Chobe should be struck. Communication with the east coast by the Zambese would thus be opened. In the case of the Mucusso being really on the bank of the Embara (and that this river is consequently the Cubango), its exploration would nevertheless be very important. The region it crosses is extremely fertile, abounds in primary materials, and appears healthy. Livingstone says that "all the country bordering on the desert from Rurumum to Litoubarouba, as well as the region extending to the north of Lake Ngami, is notoriously salubrious." The description he gives of some of these places, from a sanitary point of view, is seductive even to an European, and this circumstance is worthy of special consideration by any commercial or agricultural undertaking, either on the coast or in the interior of Africa. To carry out the exploration complete, from Humbe to Mucusso, and to the Zambese by the Chobe, fifty armed men engaged in Quillengues, besides the porters necessary for the transport of the baggage, would appear to us to be sufficient. From the mouth of the Cunene to Humbe, or *vice versâ*, the exploration could be made by some soldiers and some blacks in the State service, or natives of Humbe. The Muximbas would make no attempt to approach, seeing armed men. All the harm to be feared from them arises solely from the terror they are in lest their cattle should be forcibly taken from them.

Little is to be feared from the people of the interior, and we may here make an observation which appears to us to be relevant. Starting from the coast, as we approach the interior, the people met with—at least as far as Humbe, or even beyond that place—are progressively intelligent, and show a better state of civilisation and moral development at each stage. Thus, for example, we have the Bakuisses on the seashore inhabiting cavities in the rocks, either natural ones or made by themselves, who live by fishing or hunting, and are now in a condition very similar in all respects to the ancient Troglodytes. This race is divided into another group or family, the Baquandos, who live a little more inland, but nearly in the same manner.

After the Bakuisses, more towards the interior and extending throughout the lower and eastern region of the Xella range, come the Bakubales and other tribes of the same race, who possess herds of cattle which they pasture, and who are beginning to cultivate the land, although they are nomads, and without any really organised political society. Further still towards the interior, and occupying the high plain which extends from the top of the Xella in an easterly and southerly direction, are the Banhanecas tribes, still more intelligent than the Bakubales—husbandmen and shepherds, with a constituted political society, and with more civilised customs and usages; beyond these again, established principally on the right bank of the River Cunene, are the Muhumbes or Bankumbes, a more intelligent race than the others, with milder and better manners, more delicate tastes, and of a more agreeable society; beyond the Cunene the Banankutuba, more warlike and barbarous than the Bankumbes but more energetic, more laborious and industrious, the only people that carry on trade and practice different industrial callings, in which they are badly and to a limited extent imitated by the other races. The soba of Bale, one of the tribes comprising the above race, prides himself upon appearing dressed like a white man; he buys horses for riding, and has armed nearly all his people with guns; and the Bangangellas, one of the tribes farthest from the said race, is governed by a woman, and is the most industrious set of people known. Finally, going further towards the interior we find the soba of Mucusso, who always presents himself wearing at least a coat or cloak, and the soba of Genge, who buys all such things as are used by the whites. Livingstone says that the inhabitants of that country, the Makololos, have an ardent desire for communication with the coast.

The language, or the different dialects, offshoots of the same language, which all speak, follows the same order of progression from the coast to the interior, at least as far as Humbe. As an exception or variation of the above rule there are some wandering tribes of a peculiar race which appear among the people, principally from the borders of the region inhabited by the Banhanecas towards the interior. These tribes are neither in their language nor in their habits and customs like any other people of this part of Africa, except perhaps the Bakuisses to a small extent, and the Baquandos. The individuals of this race are generally short and paunchy, of a mulatto colour, but presenting well-pronounced characteristics of the African race. Their language consists in the utterance of successive and almost inarticulate sounds, like raps given with the tongue against the roof of the mouth, and is not understood by any of the other people. Nothing of this nature could well be imagined more primitive or less human. They go almost naked, and use poisoned arrows. They live by hunting, and on honey and wild fruits, and only communicate with other tribes for the purpose of exchanging the teeth of the elephants they kill for tobacco or "bamba." They are known and are themselves called by the name of Bakankalas.

They are generally inoffensive, and we sometimes meet them between the Gambos and the Humbe, there being on such occasions no harm to fear from them. Between the Quanhama or the Caffima,

however, and the Quangara, there is a tribe of them which attacks travellers not armed, if these are numerically small enough to plunder. Nothing is known of the origin of these people, neither are they able themselves to throw any light on it. May they not, together with the Bakuisses and the Baquandos, form the dispersed remnants of the great bushmen family which is supposed to be the aboriginal race of this part of Africa? We are disposed to believe this, and even more so, as we see Livingstone in his map, when wishing to describe the Bakankalas between Caffima and Quangari, writes: Karakeres or bushmen.

This article is already a lengthy one, and we must therefore conclude it. The importance of the subject, the urgency and necessity for the proposed expedition, and the advantages that must result from it, are convictions that are fortunately rooted in the consciences of all, and which we see unanimously shown by all. In giving publicity to what we thought and knew regarding this subject, we had only in mind the fulfilment of a duty. It is little we offer, but we have no more, and it is given with the utmost goodwill.

We had almost concluded this work when we read the article published in No. 6892 of this Journal, by Sr. Pinheiro Bayão. Thanking this gentleman for his kind expressions towards us, we are, on our part, constrained to declare that of all the persons who could contribute towards the successful issue of the projected expedition to the interior of Africa, none could do more so than Sr. Pinheiro Bayão, both by his intellect and patriotism, as well as by his special and practical knowledge, not only of the coast, but also of the interior of Angola.

Sr. Pinheiro Bayão, who has given so many proofs of his self-denial in the way in which he has served and discussed our colonial interests in the Press, would, we are sure, once again heartily dedicate himself, both with his intelligence and his personal leadership, to the completion of the most important, if, at the same time, the most arduous task that Portugal has undertaken for the benefit of her colonies. It would not be Sr. Pinheiro Bayão that would profit by this, but the country.

At all events, we express our earnest wish that such an enterprise may be realised with the aid of all who are in any way capable of supporting it, as an object which is alike interesting and honourable to Portugal.

GREAT TRIGONOMETRICAL SURVEY OF INDIA, 1874-75.

THE out-turn of work by this department amounted to eighty-nine principal triangles, covering an area of 6416 square miles, in connection with which two astronomical azimuths of verification have been measured; of Secondary Triangulation, an area of 4049 square miles has been closely covered with points for the topographical surveys, and an area of about 6000 square miles has been operated in *pari passu* with the principal triangulation; of Topographical Surveying, 5525 square miles on the scales of one inch, two inches, and four inches to the mile. Of geographical exploration much valuable work has been completed by officers of the department on the northern frontier of Afghanistan and on the lines from Ladakh to Lhasa, and Lhasa to Assam.

The financial administration of the department during the year under review has been exceedingly difficult and embarrassing. A large increase of expenditure had been occasioned by the introduction of a system of consolidated salaries, and by the resumption of operations in Burmah. The orders for these measures were speedily followed by orders for large reductions of expenditure, which, according to present arrangements, are to be gradually carried out within the next three years by the stoppage of promotions, and a reduction of numbers as vacancies occur.

The revision of portions of the Great Arc south of Bangalore having been completed, the Madras party was deputed to start the Ramnad Longitudinal Series, which is to extend eastwards from the Great Arc and along the coast to Rameswaram, with a view to the proposed connection of the triangulations of India and Ceylon. The work of clearing "rays" between the stations was very slow, owing to the occurrence of belts of dense palmyra forest intermixed with groves of cocoanut trees, which necessitated the erection of the stations to a sufficient height, by means of lofty scaffolding. Major Branfill extended a succession of quadrilaterals as far as the land's end, utilising islets of coral reef which lie parallel to the mainland at a distance of from 4 to 5 miles. The connection with Ceylon will be completed, it is hoped, by next season. A curious instance of religious bigotry was exemplified in the refusal of some village priests to allow the *gopuram* or entrance tower (80 feet high) of the Tirupullani Temple to be used for a station, although Major Branfill offered to pay liberally for the use of it. He has drawn up a most useful alphabetical list of the proper names of the stations and landmarks fixed during the season, with the root-meaning. The vernacular form was ascertained on the spot, and this will, no doubt, prove of service in correcting the spelling in further maps and charts.

As mentioned in the Topographical Surveys section, Lieutenant Harman was deputed to join the Duffla Hills expeditionary force. His first triangulatory operations were confined to the country between Jorhat and Dibrugarh. He subsequently accompanied the field force as Major Godwin Austen's assistant, and made a reconnaissance of the Ranga Valley and the hill-ranges to the east of the tracts occupied by the force. He made good friends of the mountaineers, and after an absence of three months returned to his own party, but the extraordinary difficulties of the country prevented him from completing more than two triangles.

In British Burmah the want of proper topographical maps had necessitated the suspension of the Geological Survey, and as isolated Town Surveys were being carried on, and Marine Surveys of the coast were about to be commenced, Colonel Walker was requested to proceed with the triangulation vigorously.

The Brahmaputra party was reorganised and transferred to Burmah, under Mr. W. Beverley, who worked in the country to the south of Rangoon, while Mr. Mitchell, his assistant, who was transferred from the Eastern Frontier Series, reconnoitred the ground and laid out the triangulation north of Rangoon. The object was to lay out secondary triangles from the

principal sides of the Eastern Frontier Series, in order to fix all the large towns, prominent and permanent objects, peaks, &c., in British Burmah for detail, and Geological Surveys, and lighthouses along the coast for the Marine Surveys.

Owing, however, to the unfavourable nature of the weather and difficulties of the ground, it was not possible to connect the two sections; this, however, was to have been accomplished the following season.

The Eastern Frontier Series have been extended in a S.E. direction to within 40 miles of the town of Moulmein. The same obstructions as had been met with in previous years—the dense forest and tropical vegetation growth, the sparse population, the reluctance of the Burmese to work for hire, and the practice of firing the grass jungles during the field season and so obscuring the atmosphere—all these circumstances combined to render a less out-turn of work than would have been attained elsewhere in India. The area amounted to about 3150 square miles, and the preliminary operations for future triangulation were carried over a distance of about 100 miles. One hill-station, Chaiteo, 3600 feet above sea-level, is described by Mr. Rossenrode as a very remarkable sight. It consists of stupendous projecting rocks surmounted by masses of other rock raised in successive tiers. Each of these rocks is crowned by a pagoda, the principal one standing on a rock which projects like a rhinoceros horn over a yawning precipice several hundred feet in depth. The Burmese ascribe, not unnaturally, the erection of these superimposed masses of rock to superhuman agency.

Captain Rogers's party extended its triangulation northwards through the Deserts of Jaisalmir and Bikanir, tracts which, though fairly inhabited during the rainy season, are deserted in the hot months owing to the failure of water.

The out-turn was very good, amounting to an area of 2472 square miles.

The topographical operations in Kattywar have been carried on under the charge of Captain Pullan, owing to Captain Trotter's engagements on duties connected with the Geographical Exploration beyond the British Frontier. The area topographically surveyed amounted to 1749 square miles, while preliminary triangulation was extended over 2200 square miles. On reaching the coast of the Gulf of Cutch a satisfactory junction was effected with the Marine Survey of that gulf, executed by Commander A. D. Taylor. This portion of the country lying along the borders of the Gulf of Cutch proved very difficult to survey on account of the treacherous mud banks and mangrove swamps which fringed the coast.

Major Haig was engaged during the year under review in carrying on a system of survey planned so as to combine the work of the Bombay Revenue Survey with the accurate measurements of the professional survey. This combined survey is on the scale of 4 inches for the British districts and 2 inches to the mile for the Native States. The area surveyed topographically was 1375 square miles, the out-turn being almost exactly double what it was the previous year when the operations were of a tentative nature, and the best method of utilising the Revenue Survey details had still to be ascertained. About 550 square miles were surveyed by Lieutenant Gibbs, in the Dang Forests, the Dang Hills being the first step of the trap formation leading to the Deccan table-land. Lieutenant Gibbs says that in the Gaekwar territory he was struck with the wretched state of the trees, especially teak, and that one might reckon on the core of any teak-tree over a foot in diameter being rotten, and the trees all misshapen. On working into the Dang States, the superiority in size, symmetry and healthy growth of the trees under the Forest Department strikes the untrained eye at once. A copious list of trees and plants is given by Lieutenant Gibbs, with the scientific name and locality.

The Surveyor-General of India having expressed very decided opinions against the expediency of using at all the Bombay Revenue Survey work for geographical purposes, a conference of Survey and Engineer Officers was assembled by Government to report on the whole subject, including the question of scale, but, owing to the divergences of opinion, no report could be agreed on. Under these circumstances Government ordered the adoption of a medium course, and directed the employment of the 2-inch scale and the utilisation of the Revenue Survey maps.

The Surveys in the Dehra Dun and the Siwalikhs are being carried on conjointly by part of the Kumaun and Garhwal party, under Captain Thuillier, who is surveying the non-forest tracts and by the newly formed Department of Forest Surveys, under Captain Bailey. The areas topographically surveyed by this combined party were 225 and 288 square miles respectively, the ground, particularly in the interior of the Siwalikhs, being very broken and difficult to delineate.

During the rainy season of 1874 a detachment from Captain Thuillier's party under Mr. Ryall was located at Almora, with a view to make the most of the short interval between the cessation of the autumnal rains and the setting in of winter weather. The out-turn amounted to 2176 square miles, and the portion of country triangulated in advance covers 800 square miles. Much of this work required all the skill and nerve of the surveyors, owing to the great height of the mountains; Mr. Pocock's work, particularly in the upper part of the Mana Valley, lay above 21,000 feet, the maximum height reached being over 22,040 feet above sea-level. There only remains now 1200 square miles to be completed, but, operations in these desolate and inaccessible regions being expensive, their further progress has for the present been postponed.

The spirit levelling operations in the Madras Presidency were undertaken by Captain McCullagh (*vice* Lieutenant Harman, transferred to Assam) who carried his work from the S.W. end of the Bangalore base to Bellary, and thence to Raichore Railway Station, a total distance of 297 miles. At Bellary a junction was effected with the line of levels which had been carried from thence to the Port of Karwar in the preceding season. There was a discrepancy of 4·5 feet: this will probably be eliminated when the mean sea-levels at Karwar and Madras have been exactly determined.

The determinations of mean sea-level in the Gulf of Cutch, commenced in 1873 and continued up to the year under review, were undertaken as a first step towards deciding whether progressive changes are

taking place in the level of the land at the head of the Gulf, as has long been supposed to be the case. It is proposed that the operations shall be repeated at the same points a few years hence, and the comparison will show what variation has occurred.

At Okha the breaks in the continuity of the registration were very short and of no importance; at Hanstal they were more numerous and longer, the water being here muddier and causing more sediment. Owing to the trying nature of the work of inspecting the stations during the monsoon, the registration was continued to within a few days of the commencement of the monsoon, and the stations then dismantled, the cylinders being surmounted by cairns to serve future identification. The first series of operations to determine the relative changes of land and sea is thus now accomplished.* From the combined tidal and levelling operations preliminary results have been obtained, showing that the mean sea-level is higher by 7 inches at the head of the Gulf, and by 4 inches midway up, than it is at the mouth of the Gulf.

During the year 1875 the tidal observations taken in 1871-72 at Tuticorin had been reduced by the harmonic method by M. E. Roberts of the Nautical Almanac Office, and mathematical expressions have been deduced by which the height of any tide may be computed with great exactitude.

In consequence of Captain Herschel's absence from India, and of Captain Campbell being deputed to assist Colonel Tennant in the operations connected with the transit of Venus at Roorkee, the determinations of longitude by the electro-telegraphic method have been suspended during the year under review.

THE ABBÉ DESGODINS ON TIBET.

SEVERAL contributions from the pen of the Abbé Desgodins, on the subject of Tibet and Indo-China, have appeared in recent numbers of the *Bulletin of the French Geographical Society*. The Abbé Desgodins' position, as missionary at Yerkalo, has afforded him opportunity of acquiring knowledge respecting the still obscure geography of the region between India and China. He asserts positively, from his own observation, that the two mountain-chains which separate the basins of the Kinsha or Yang-tze, Mekong, and Salwen from one another, are totally distinct from the Himalayas system. To the west of the Salwen lies another range, which may possibly be connected with the Himalayas, and which probably form the watershed from whence the Irrawaddy springs. The Abbé hazards a conjecture that the western range referred to is a continuation of the mountains which bound the Tibetan plateau on the north, and turn sharply round to the south about 95 E. longitude, and that the two other ranges start from the boss or mass mountains to the south-east of the great Gobi desert.

Tibet, which the Chinese call Si-tsang, is called Po-yul in the indigenous tongue, and has been divided into two parts, Tu-pu and Mu-tu (Upper and Lower Tibet). Before the Chinese conquest in 1720, Tibet was bounded by Great Bokhara on the west, and included Sikkim and Bhutan, besides the north-eastern portion of Yunnan; while on the east it reached the mountain-chain running along the left bank of the Ya-long-kiang, and in the northern part of the valley included eighteen Tibetan chieftainships, as well as the territories of Ba-thang, Lythang, and Kinchuan or Serkha. But after the Chinese conquest, though the limits remained unaltered on the north, west, and south, the three territories and eighteen principalities above-named were withdrawn from Tibet and placed under Sz-chuen; and A-ten-tze and Chong-tien were relegated to Yunnan; and the eastern frontier of Tibet, which became tributary to China, was fixed as the water-parting of the Lan-tsang-kiang and Kinsha-kiang as far as 29° 30′ N. latitude, and in its southern portion, the water-parting of the Lan-tsang and Lu-tze as far as 27° 30′ N., where it joins the eastern prolongation of the Himalayas. But all the territory comprised within the above-named limits was not left subject to Lhasa, for several Tibetan principalities, such as Sakiagung on the west, Po-yul on the south-east, Chra-ya, Cham-on-to, Siling, and others on the north-east were placed under the direct rule of a Chinese mandarin at Lhasa entitled *Itsin*. It is not until recent years that these limits have undergone modification; Ladak, Sikkim, and Bhutan are now more or less emancipated from Tibetan control.

The Abbé remarks further that though Tibet has lost territory to the west and south, she has gained Degue to the north-east (in 1863-4), and that the apathy of the Peking Government and the corruption of its mandarins in Tibet may lead to Ba-thang and Ly-thang being eventually recovered by Tibet.

After some remarks on the mountainous character of Tibet, the structure of which he compares to a large sheet of crumpled paper laid on a table, the Abbé turns to the mountain-ranges, and observes that, in his opinion, the Himalayas cannot possibly extend beyond 94° or 95° E. longitude, as the two ranges between the Kinsha and Lan-tsang, and the latter and the Lu-tze, run without interruption or ramification from 34° or 35° N. latitude to the southern extremity of the Indo-Chinese peninsula, and form an effectual bar to any transverse prolongation of the Himalayas.

No missionary or European has ever penetrated to the west of the Lu-tze, but Desgodins is nevertheless of opinion, judging from native report, that there is a third range running north and south-west of the Lu-tze. The traveller from Cha-mon-to (about 32° N. latitude) to Lhasa crosses, first of all, the range separating the Lan-tsang and the Lu-tze; then the last-named river by a wooden bridge, built on stone piles, at a place called Kiag-yu-kias by the Chinese, and Yel-ye-sam by the Tibetans, then proceeding towards Lhasa, he passes over a high mountain-range running east and west, at the village of La-ly (Tibetan, La-re-go). This range bounds the independent territory of Pomi or Po-yul on the north, and then turns southward on reaching the right bank of the Lu-tze, and separates Pomi from Dzogong, which embraces territory on both sides of the Lu-tze and its tributary the Oo-kio. The same range occurs again between 28° 30′ and 27° 30′ N. latitude.

With regard to the range crossed in journeying from Cha-mon-to to Lhasa, the Abbé is unable, for

* The final reduction of the registrations is being now (January 1877) carried on in England.

the want of sufficient information, to identify it with the Kuen-Lun or any other range.

Turning now to the rivers, the Abbé says he was, at the outset, a believer in the identity of the Brahmaputra and Irrawaddy. But native information, supplied to him at various periods between 1864 and 1874, convinced him that this was an error. Several natives informed him that after leaving Lhasa they had followed the valley of the Yarkio-tsang-po (Brahmaputra) as far as the country of the Lhopa or Slo (Abors) savages, and that the river flows in a southerly direction through this country, breaking through rocky mountains, which are ascended and crossed by ladders, as, owing to their excessive steepness, there is no route alongside of the stream. The volume of water was great, and comparable with that of the Lu-tze.

A slave from the Mu-ua country told the Abbé that, having gone to Assam for trading purposes, he was taken prisoner by the Mishmis, and by them sold to the Tibetans, from whom he was rescued by the missionaries of Bonga. He gave similar information with regard to the junction of the Tsang-po and Brahmaputra, but the name he applied was *Dehon* to the portion of the river in the Lhopa mountains, showing that he must have heard it called Dihong. Another important fact ascertained by the Abbé from a large number of natives, who all agreed on this head, was that in the belt of country between the Mishmis and the Lu-tze—a tract of about twelve or fifteen days' journey across—no stream of any considerable size occurs. The Yarkio-tsangpo is thus manifestly identical with the Brahmaputra.

From the foregoing, it follows that the Irrawaddy must rise south of latitude 30° N., and native information corroborates this, and makes it receive a minor tributary from the east. The Salwen (called Ngen-kio in Tibet) rises in the mountain-chain which separates Koko-Nor from the north-eastern part of Tibet, passes through Dzo-gong or Tsa-ua-dzong, and then separates Burmah from Siam, the lower portion of its course being well-known, Near Mekong, between 28° and 29° N. lat., the Lu-tze receives from the east a tributary, Oo-kio, which is to be found on no map except that of Delisle (1723). The Oo-kio rises about 31° N. latitude.

The Mekong or Lan-tsang rises about 33° or 34° N. latitude in the Kuen-Lun range near Koko-Nor. Its two branches have their confluence about the 30th parallel north of Cha-mon-to or Kiamdo, and it then traverses the provinces of Chra-ya and Riang-ka, before entering Yunnan. About the latitude of Cha-mon-to the rivers are distant three or four days' journey, and below Yerkalo this interval is reduced to two.

The remainder of the article is occupied by an elaborate criticism by the Abbé Desgodins of the work of the French Expedition up the Mekong, to which, in spite of several errors in their account of the geography of Indo-China, he awards a warm tribute of praise.

Our readers will find the map accompanying the *Bulletin* for October 1875 the best one with which to follow the Abbé's account of Tibet and Indo-China.

Reviews.

—:o:—

SCURVY IN HIGH LATITUDES.*

THE outbreak of scurvy in the late Arctic Expedition is an event of such interest in itself, and is geographically so important as affecting future exploration, that we need scarcely apologise to our readers for bringing this pamphlet to their notice. The views of Dr. Black were communicated to the *Times* in a letter which was published on the 1st of December. A second letter was sent on the 8th of the same month, but was not inserted. For in the interval the *Times* had, in a leading article, committed itself to the assertions that the sole cause of scurvy was the want of vegetable juices, that the sole preventive was lime-juice, and that there was no instance of scurvy breaking out when lime-juice had been regularly administered. Not satisfied with thus committing itself, the *Times*, in another article, alleged that in former Arctic Expeditions the sledging-parties always took daily rations of lime-juice, professing to base this assertion on official documents. Admiral Ommanney, Admiral Richards, and Dr. Scott, officers against whose evidence there could be no appeal, at once testified to the absence of truth in the assertions of the *Times*.

Dr. Black, who has now published his two letters in the form of a pamphlet, is physician to St. Bartholomew's Hospital, and was for many years physician to the old 'Dreadnought;' so that there can be few medical men who have had wider experience of the treatment of scurvy. We, of course, are unable to give an opinion on the correctness of his views; but the intolerant dogmatism of the writer in the *Times* naturally creates distrust; especially as we know that, in many instances, scurvy has broken out in spite of the regular administration of lime-juice. Indeed the late Arctic Expedition is a case in point. Dr. Black's position and long experience entitle his views on this subject to respectful attention.

His argument is as follows:—Vital heat and energy are the results of consuming oxygen, and their existence requires that the temperature of our bodies should be maintained at about 98°. In extreme cold this can only be done by the consumption of large quantities of heat-giving food. The Eskimo keeps himself up to 98° by eating blubber. His temperature is not higher than ours, his work is not greater. The pounds of seal-fat he consumes go out of his body in breath—that is, in water and carbonic acid. It is this combustion of his food which has kept up his temperature, whilst his body at the same time has maintained its integrity. By his breath he has taken in just so much oxygen as has sufficed to burn the oil which is required to do his mechanical work, and keep his body up to 98°. The amount of oxygen which is necessary for him to do this is the exact amount which is necessary for ourselves in the same conditions. Dr. Black then remarks that a cup of

* *Scurvy in High Latitudes*: An attempt to explain the cause of the "medical failure" of the Arctic Expedition of 1875-76. By Patrick Black, Physician to St. Bartholomew's Hospital. (Smith & Elder, 1876.) Pamphlet 8vo., pp. 16.

lime-juice will not satisfy this demand; that it will utterly fail to meet the claims of so much oxygen as will convert a bladder of lard or a gallon of oil, into its equivalent of water and carbonic acid. He maintains that the doctrine of anti-scorbutics is utterly rotten and untenable, the last remnant of a bygone and obsolete physiology. There is no anti-scorbutic, or rather all food is anti-scorbutic though in most unequal degrees. Fat and oil stand at the head of the class. Sugar has a high place in the scale, containing 6 lbs. of carbon in every 15 lbs. Potatoes rank high on account of their starchy elements. Lime-juice stands very low indeed, and is about on a level with toast and water in keeping scurvy at bay. Take a puncheon of lime-juice, evaporate it to dryness, weigh the residue, burn it, reduce it to ash and carbonic acid. The quantity of oxygen it has taken to do this, a decimal of a grain, represents the anti-scorbutic virtue of lime-juice. As we understand Dr. Black, scurvy is caused by any conditions which prevent the body from being kept at a temperature of 98°; whether it be bad or improper food, insufficient quantities of food, intense cold, or any other cause having this effect. The prevention is secured by supplying food of the kind and in the quantity that will ensure the required effect; and the cure of course depends on the same means. Administration of lime-juice, when scurvy has been prevented or cured, may have been accompanied by such increase of food, change of diet, or other health-giving conditions, as at the same time to furnish the real preventive or cure. We know certainly that lime-juice alone, even when most regularly administered, does not prevent scurvy.

A RIDE TO KHIVA.*

IT was a strange whim that took Captain Burnaby to Khiva. He learned that the Governor-General of Turkistan had absolutely prohibited the admission of Englishmen into the province, and that one had already been turned back by the authorities, who had attempted a journey in that direction. The effect of this upon Captain Burnaby was just the reverse of deterrent. Having been disabled by illness in 1873, when he had made up his mind to go to Khiva by way of Persia and Merv, to witness the invasion of Khiva by the Russian troops, the enigmatic veto of General Kaufmann put it at once into his head, when he was looking out of a window on the White Nile, to carry out his project forthwith, jumping even through the paper hoop of Kaufmann's prohibition. Captain Burnaby did it this way: He proceeded to St. Petersburg and negociated directly with the Minister for War, who after long delay acquainted him that the commandants in Russian-Asia should be instructed to aid him in his journey, but that acquiescence to the extension of his travels beyond Russian territory was withheld because of the inability of the Russian authorities to answer for the security of the lives of travellers beyond the limits of the Emperor's dominions.

Nothing but the strongest determination, the most indomitable perseverance, could have taken Captain Burnaby to his journey's end; and how that journey was performed is best told in the author's own words.

From St. Petersburg Captain Burnaby took the rail to Moscow, and thence by Penza and Riajsk to Syzran, the limit of the rail in that direction. From this latter point his real travels commenced, and as far as Kazala, on the Jaxartes, he had experience in Russian and Kirghiz posting with horses and camels, after which he traversed the Kizil-Kum on horseback.

It would appear that he passed on through Russia when the winter season was setting in, when the rivers were frozen, although the ice was not quite strong enough to bear, consequently he was at times obliged to leap over streams with the aid of a pole, and suffer the terrors of Russian snow-drifts and hard frost, at one time being so severely numbed that but for the kind efforts of a Cossack to restore circulation to his limbs, he might have returned home an armless cripple.

In a most vivacious and in a gossipy manner the author leads and conducts his readers through a series of most interesting scenes, writing in the simplest language, and dilating on the characteristics, habits, and customs of the natives of the countries through which he passed in a way which brings them home to us very nearly, and which impresses us with the idea that he either knew them before, or that he has a very keen instinct and a very remarkable intelligence.

The scraps of conversation and the incidents evidencing the tone of political opinion in Russia, the *bonhomie* yet the wilfulness of the Russian, the ignorance of Russian administrators, the excellent qualities of the unsophisticated poor, and illustrating the contrasting peculiarities and quaintnesses of the Kirghiz and the Khivan, are happy to a degree. At the same time, the reader will not be able to resist a loud guffaw over many passages, as when, for instance, he comes to the description of the shaving process to which Captain Fred Burnaby voluntarily and of set purpose resigned himself, in the presence of a large and laughing audience in Khiva: the native barber took him by the nose, and put his thumb into the Captain's mouth.

On his way to Khiva, Captain Burnaby was necessarily obliged to avoid the Russian fort on the Oxus, and so slipped into the khanat without the knowledge of the Russian military authorities. But he was soon found out, and, under excellent pretences, was summoned by General Ivanof to Petro-Alexandrofsk. In the meanwhile, however, Captain Burnaby had time to interview the Khan of Khiva, and had had very interesting conversations with him and his ministers. The following amusing conversation took place between Captain Burnaby and a Russian military officer at Orsk:—

"'He looked at my pass—'So you have come from Khiva?'

"'Yes.'

"'You are English?'

"'Yes.'

"Here the man looked at me very fixedly, and continued:

"'Will England cede us Kashgar?'

"This question rather amused me, and I replied, pointing to a horse that was being led by the station, 'Will you cede that horse to me?'

"'He is not my property,' said the man, looking a little astonished at the question.

* *Travels and Adventures in Central Asia*, by Fred Burnaby, Captain Royal Horse Guards. With Maps. Third Edition. (Cassell, Petter and Galpin, 1876.)

"'Well, Kashgar is not an English possession, and how can we cede to Russia what does not belong to ourselves.'

"'Then England will not fight with us about Kashgar?' inquired the inspector.

"'I really don't know, but I wish she would,' I replied, becoming a little annoyed by this evident attempt at cross-examination. 'Anyhow,' I continued, 'if you put your noses into Afghanistan, you will very likely get them pulled for you.'

"'Afghan!' said the man; 'oh, very good.' And taking a piece of paper he wrote down,—'If Russia should take the fortress Afghan (Krepost Afghan), there will then be war between England and Russia."

"'I have noted your words down,' he said.

"'So I see,' was my remark; 'but Afghan is not a fortress.'

"'That does not signify,' said the inspector; 'it is something, and you have said that if we take it there will very likely be war.'"

Captain Burnaby's *Ride to Khiva* is in every respect a charming book, and the value of it is not a little enhanced by the excellent maps attached to the volume.

———:o:———

THE SAILOR'S HORN BOOK OF THE LAW OF STORMS, by *Henry Piddington*, President of the Marine Courts, Calcutta. Sixth Edition. (Williams and Norgate, 1876.)

CAPTAIN HENRY PIDDINGTON, of Calcutta, was an industrious contributor to the study of the law of storms. His attention was first turned to the subject by the reviews of Colonel Reid's work, at a time when he had retired from a seafaring life, and held several posts at Calcutta, including the Presidency of the Marine Courts and the Sub-Secretaryship to the Asiatic Society. The law of storms was to him a subject connected with many associations of his early life, and more especially with one instance in which to the veering of a hurricane alone he owed his safety from shipwreck. His first memoirs on cyclones were published in 1839. In the following year he received extracts from numerous logs preserved at the India House, furnishing records of hurricanes from 1780 to 1840; and he thus accumulated proofs that these great storms are circular, that they turn from right to left, north of the Equator, and that they are progressive. He also made out the tracks on which they move, and their rates. Captain Piddington continued to publish accounts of all the important cyclones that occurred in the Eastern Seas from 1839 to 1851. This involved immense labour and research, the untiring and persevering collection of materials, and no small ability and judgment in their arrangement. Each memoir was accompanied by a chart showing the course of the storms. Altogether Captain Piddington published twenty-four memoirs on cyclones in the Journal of the Asiatic Society of Bengal

His chief work, however, was the *Sailor's Horn Book of the Law of Storms*, which was published in Calcutta, the second edition appearing in 1845. We heartily welcome the appearance of a sixth edition of Piddington's Horn Book, which has just been brought out by Messrs. Williams and Norgate. In a small compass will here be found a history of the science, an explanation of the various theories regarding cyclones, the tracks of cyclones in various parts of the world, accounts of storm waves and inundations, and the application of what has been ascertained on the whole subject. It is a thoroughly practical book, and no seaman's library should be without it.

———:o:———

ETRUSCAN BOLOGNA: A Study. By *Richard F. Burton*. London (Smith, Elder & Co.), 1876.

CAPTAIN BURTON'S versatility of taste strikes us forcibly on turning to the present work. We had barely finished following the fortunes of Hans Stade in Brazil, under the guidance of the gallant captain, when, hey! presto! we are hurried off by him to the Angola Coast; his next care is to instruct us in the technical mysteries of swordsmanship, and from this subject he now darts off to present us with a study of Bologna, in the days of that old and little-known race, the Etruscans.

Bologna, originally Felsina, appears to be the centre of a whole circle with a radius of 22 kilometers, which teems with Etruscan antiquities. Many of these are preserved in the two public museums of the city, and several private collections, and are described with minuteness by Captain Burton. The most remarkable "find," however, was the excavation of the Certosa in 1870-1, which resulted in the discovery of the burying-place of the western *regio* or district of Felsina. The objects found here, Captain Burton remarks, illustrate admirably the home life, the warfare, the religion, the luxury of northern Etruria, in the days of her highest development. After introducing the subject of the Etruscan man from an ethnological point of view, Captain Burton presents us with an able, though at times, to our thinking, a little too dogmatic a sketch of the geological history of early Italy. We are then furnished with a brief account of the four "waves" of invasion from the East, which resulted in the irruption of the Turis'a or Tusci or Etruscans in the fourteenth century B.C., a nation which is supposed to have occupied, as a great military power, the central peninsula with 300 *oppida*, and to have flourished for a period of between nine hundred and a thousand years. Captain Burton remarks that while the cosmogony of the Etruscans is Asiatic, the vast scheme of their religion, numbering upwards of two hundred gods and supernaturals, connects them with Persia, India and even Greece.

It would be beyond our power in a brief notice like the present to follow the author in his learned disquisitions on the language and craniology of the Etruscans. Captain Burton has treated every branch of his subject exhaustively, as is his wont, and though his work may appear from the title to be limited in its scope, it really performs the same office for North-Eastern Etruria that Dennis's great work and Mrs. Hamilton Gray's earlier volume did for the Middle and Southern portions of the Confederation. The last-named work should not be forgotten by the reader, for though we have not observed any reference of Captain Burton's to it, it is to its authoress that we are indebted for having first brought the fascinating subject of Etruria before the notice of the English public.

———:o:———

DIE CHINESISCHE AUSWANDERUNG. Von *Dr. F. Ratzel*. Breslau, 1876. (London, Trübner.)

IN a handy volume of 275 pages, Dr. F. Ratzel, of the Polytechnical School at Munich, not only traces the history of Chinese emigration, but also the position of the Chinese emigrants in the countries which they have selected for settlement. He first of all describes China, its people and institutions, discussing more particularly the causes which lead to voluntary as well as to compulsory education. He then takes us to each of the Chinese colonies, beginning with Mongolia, which is being steadily invaded from the south by industrious husbandmen, who are converting its unproductive wilds into fertile corn-fields. The author discusses the various questions connected with Chinese emigration fairly, without bias, and at the hand of the most trustworthy authorities. His book is brimful with facts, which have been marshalled with great skill. The subject is one of the most interesting, the author has done justice to it, and a translation of his valuable volume would no doubt prove acceptable to numerous English readers.

Log Book.

—:o:—

Results of the Voyage of the 'Polaris.'—Dr. Emil Bessels has completed the first volume of the work on the scientific results of the voyage of the steamer 'Polaris,' which is being prepared at the expense of the United States Government, under the immediate superintendence of Professor Joseph Henry, President of the National Academy of Sciences. The first volume contains the sections on hydrography, temperature of the air, hygrometrical observations, atmospheric pressure, winds, solar radiation, terrestrial radiation, face of the sky and state of weather, observations on ozone, meteorological observations taken at sea, chronometer journal, astronomical observations, pendulum experiments, magnetic observations and list of auroras, and psychrometrical tables. The tidal observations, including diurnal inequality, and investigation of the form and progress of the tidal wave, are especially important. The volume is illustrated by numerous diagrams and tables.

New Map of Bolivia.—Mr. J. B. Minchin, C.E., assisted by Commander Musters, R.N., have completed a new map of the Bolivian Republic, based on accurate astronomical observations. Mr. Minchin arrived in the country at the close of 1873, and his attention was early called to the generally defective state of the existing maps of the country. In the construction of the new map he has adopted a scale of 15 inches to the degree, as being the smallest on which the *quebradas*, or ravines, and hill-ranges could be conveniently shown. The longitude of Sucre, the capital of the Republic, was fixed by Mr. Minchin and Captain Musters, by means of lunar distances, eclipses of Jupiter's satellites, and lunar occultations: the mean of the results making it 65° 17′ west of Greenwich. This is taken as the first meridian on the map. The instruments used for the rest of the work were a sextant and artificial horizon, and a 6-inch Troughton and Simms' theodolite. Most of the principal places have been astronomically fixed by meridian altitudes of the sun and stars; and the longitudes by chronometer time-sights from Sucre, checked by prismatic compass-bearings of conspicuous peaks. La Paz, like Sucre, had its longitude fixed independently by eclipse reappearances of No. 1 satellite, and lunar occultations, observed with a 3-inch Troughton and Simms' telescope. The heights above the sea were ascertained by Casella's boiling-point thermometers, tested at Kew. Magnetic variation was observed for at La Paz (9° 45′ E.) and Sucre (9° 35′ E). It is to be hoped that some arrangement may be made for the publication of this valuable map of a little-known part of South America, in order that geographers may reap advantage from the admirable work of Mr. Minchin and Commander Musters.

Cyclone and Storm-wave in Bengal.—This appalling catastrophe which overtook the districts of Backergunje and Noacolly, in Lower Bengal, on the morning of the 1st of November last, has resulted in a loss of human life estimated at 215,000 souls, in an area of some 3000 square miles, inhabited by about 1,062,000 persons. There was a severe cyclone in the Bay of Bengal on the night of the 31st of October, but it was not the wind which proved so destructive (though that was bad enough) as the storm-wave, which swept along to a height from 10 to 20 feet, and inundated the districts. Whence this inundation came is at present the subject of meteorological inquiry at the hands of the Meteorological Reporter to the Government of India. The suddenness of the onset of the wave was such that the people had no time to clamber up to the roofs of their homesteads, but were lifted up to the surface of the water, together with the beams and thatches of their cottages. Each hamlet, consisting of four to six houses, is surrounded by a belt of trees, and these with their long, stretching arms, in many instances proved the salvation of large numbers of villagers. A peculiar feature of this physical commotion is that, while the water felt warm, the air, on the other hand, was bitterly cold. A part of the abundant rice-crop will be saved, and most of the trees, fruit-bearers or others, will recover; the wealth lost (except in the case of Dowlutkhan, a rich trading town, clean destroyed) being almost entirely agricultural, crops or cattle. The most efficient measures have been taken by the Lieutenant-Governor, Sir Richard Temple (from whose Minute the foregoing particulars are borrowed), to alleviate the distress, to prevent the outbreak of sickness or pestilence, and to re-establish social and commercial intercourse. As he feelingly expresses it, "Our object is to let the poor people see that the authorities are thinking, caring, feeling for them in their misery. This knowledge will brace their nerves, raise their spirits, and induce them to return promptly to all their accustomed industries." No appreciable loss of revenue is anticipated, and the expenses of relief will probably be met from the provincial funds without recourse to the Government of India.

Portuguese Colonies.—An interesting summary of information respecting the colonies owned by Portugal in different parts of the world, will be found in the October *Bulletin of the Paris Geographical Society*. They consist of the Cape de Verde Islands, the possessions on the coast of Guinea, St. Thomas and Princes Islands, Angola, Mozambique, Goa, Damaun, Diu, Mahe, Macao, Timor and Pulo-Bambing. Angola is the most populated and the richest of all, having made great strides of late years. It is divided into three regions—the coast district, which is sterile; the rising ground, which is extremely fertile; and the table-land, which is like Southern Europe in respect of climate. The population of the province in 1869 amounted to 433,307, and the value of its exports for the twelve months ended June 1874, was a little under £600,000.

A German African Society.—A German African Committee, in connection with the Brussels International African Association, has recently been formed at Berlin, Prince Reuss being elected President, and Herr von Beusen, Secretary. At its first meeting, which was attended by many influential persons, it was resolved that the Committee should assume the title of "The German African Society." A resolution was also passed to ask the Crown Prince of Germany to become Patron of the Society.

Correspondence.

—:o:—

THE COMANS OR KIPCHAKS.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

DEAR SIR,—Some years ago I wrote a paper on the Comans, which was published in the *Journal of the Ethnological Society*, in which the evidence was collected upon which it is almost universally accepted that the Comans were Turks—a view so well settled and so conclusively demonstrated long ago by Klaproth and by others since, down to the author of a paper in a recent number of the *Journal of the German Oriental Society*, that it would be mere waste of time to adduce the evidence upon which the conclusion is based, and I shall postulate it as an accepted fact.

The Comans were known to the Russians as Poloutsi, a name of which I do not know the exact etymology. The current one that it means *merely* the steppe or lowland men, the first particle of the name being connected with the Po in Poland, &c., not being deemed satisfactory by Russian students, and I should like to have some information on the subject.

Von Hammer says the name is compounded of pole, plane, or steppe, and Outsi or Uzi, a well-known Turkish name in the Byzantine writers (*Golden Horde* 18), but this I much question: the Uzes and Poloutsi, as I shall show presently, were not the same people.

To the Germans the Poloutsi were known as Valans; thus Rubruquis says: "To the Germans they are known as Valain, and the country as Valania (*Rubruquis d'Avezac*, 246). While in a letter of some friars, describing the Mongol invasion of Hungary, dated July 1241, and given by Matthew Paris, we read: "Kumani, whom we Germans call Valven" (*Wolff Geschichte der Mongolen*, 254). They were called Falones by Otto of Freisingen, Valui by Henry the Lett, Value by Arnold of Lubeck, Valewen and Valwen in the Chronicle of Luneburgh (*Zeuss*, 744 and 745). Zeuss says that the name Falawa is word for word Poloutsi, which he treats as meaning steppe-men (*id.* 744); other writers have compared the name to the Phali in Westphali and Ostphali, but of which no satisfactory explanation has been offered. Latham says, probably justly, that it is connected with Volhynia, the district from which the Comans may well have made their first acquaintance with the Germans, and it may be the name means merely the people of Volhynia. However this may be, it seems clear that the name Falawa, like Poloutsi, gives us little information about the original habitat or origin of the race.

Let us next turn to the name Coman. This name is almost universally derived from the River Kuma, which flows through the steppes north of the Caucasus, the country about which was known to the Persians as Kumestan, and which the Nubian geographer, Edrisi, calls Al Comania, adding that it gave their name to the Comanians (*Klaproth's Travels in the Caucasus*, 155). On the other side of the watershed, and in the same wide steppe, we have the River Kuban, which is called Kuman by the Nogays, who, like other Turks, do not always discriminate between *m* and *b*. Lastly, in the south-eastern corner of the Caucasus there is a town called Kuba, which may similarly be another form of Kuma. We thus find the name Kuma or Kuman occurring more than once in this area; and it is a very old name, for Pliny mentions a fortress of Cumania, situated on a rock near the Caucasian gates.

Not only their name, but also all their traditions, justify us in deducing the Comans from that pocket of land enclosed on the south by the Caucasus, and on the east and west by the Caspian and Black Seas respectively; but the name Coman is a geographical name merely, and does not enable us to trace the origin of the tribe very far. For this we must turn elsewhere.

Rubruquis tells us that those whom he calls Comans bore the indigenous name of Capchat, that is the well-known Turk tribal name of Kipchak. In this he is supported by Rashid ud din, Ibn al Athir, and the other historians of the Mongols, who call those tribes Kipchak which are named Coman in the contemporary narratives of western writers. And it was from them, when so called, that the Khanate of the Golden Horde was known as the Khanate of Kipchak; while the steppe north of the Kuma, which coincides more immediately with the Kumestan of Edrisi, was known until recently, and perhaps is still known, as Desht Kipchak. In this name we are on the trace of more fruitful matter. The name Kipchak occurs elsewhere, and still survives as that of a conspicuous section of the Turkish stock. Thus a main division of the Uzbegs is called Kipchak. One of the four chief divisions of the Middle Horde of the Kirghiz Kazaks is also called Kipchak.

The modern Kipchaks, therefore, form a section of that very pure Turkish race which is generally known as the Kirghiz Kazaks, but which is more properly called simply Kazak, which again, as I have argued in your pages previously, I believe to represent very purely and very markedly the Ghozz Turks of the Arab writers.

I believe that the Comans or Kipchaks of the Kuma belonged to the same Turk stock; and the question arises when and how did they reach the steppes of south-eastern Russia? The Russian chronicler Nestor speaks of them for the first time in the year 1055; while Scylitzes, who is the first of the Byzantines to name them, does not do so till 1078. Von Hammer, who names them in 995, is clearly mistaken, and has really ante-dated the particular invasion he mentions by a century; and we may take it as settled that there is no evidence of their presence in the Russian steppes before the middle of the eleventh century.

The Comans or Kipchaks, therefore, so far as we have any evidence, first occupied the Caspian steppes about the year 1055. Whence did they come? There are only two available directions, either from the south across the Caucasus, or from the north across the Volga. The latter is the generally received opinion, but I believe it to be faulty, and I believe that they came from the south.

M. Brosset, in a note on the Armenian village of Acorhi and the Convent of St. James, published in the *Bulletin of the Russian Academy*, viii., 43, tells us that a certain *Khiphtchakh* Khupasar is mentioned in the history of the Orpelians as having assisted George the King of Georgia against Ivan the Orpelian, and that King David the Restorer had 40,000 Kipchaks in his service, who assisted him in his various campaigns; and, he adds, there were therefore, in Georgia and Armenia, a certain number of people of this race who had settled there as early as the commencement of the twelfth century. When Subutai and Chepe, the two Mongol commanders, forced the passes of the Caucasus, we read of the Kipchaks being in close alliance with and forming a part of a confederacy consisting of Alans and Yasses or Ossetes.

It would seem, therefore, that there was a considerable element of a Kipchak origin in the Caucasus and the countries to the south. Let us get a little closer. Armenia was first invaded in force by the Turks in the year 1048 and 1049. We are told by Ibn al Athir that a considerable body of Ghozz of Transoxiana went to Ibrahim Inal (one of the generals of Thogril Beg, the Seljuk Khan of Persia) who said to them: "My country is not large enough for you to dwell in and to supply you with food; it is necessary to undertake an expedition against the Romans; you will fight in the name of God, and will gain much booty. I will march after you and support you in your enterprise." "The Ghozz accordingly set out and Ibrahim presently followed them. They advanced as far as Melazherd, Erzerum, and Kalikala, whence they penetrated to Trebizond. . . . .

Another body of the Ghozz had previously entered the Roman country, but their chief had returned to Thogril without doing much" (*St. Martin's Mémoires sur l'Arménie*, ii., 215 and 216). These Ghozz are the Oghuz Turks of other writers, and from this date they would seem to have settled down firmly on the borders of Armenia.

On turning to the Armenian account, as given by Stephen Orpelian, we find it stated that in 1049 the Ismælites, descendants of Hagar, attacked the Christians, and overran Khorasan, Khuarezm, Khuzestan, Fars, Kerman, Bokhara, Mazanderan, Irak, Baghdad, Basrak, Harran, and Azerbaidjan, and they assembled a great number of Persians, Khazaks, Kharazmians, Arabs, and Scyths of Turkistan, and encamped in great numbers on the plain of Erzerum, intending to destroy the name of Christian among the Armenians, Greeks, and Georgians (*id.*, 67). I have small doubt that the Khazaks of this account—which, by the way, is, according to St. Martin, the first in which the name Kazak occurs—were Kipchaks. Shortly after this, says St. Martin, they (*i.e.*, the Kazaks) settled in Georgia with other Turkish tribes. This was in the reign of George II., who occupied the throne from 1072 to 1089. Their descendants, we are told, still live there, speak a Turkish dialect and profess the Muhammadan religion. They have given its name to a district of southern Georgia, situated on the right bank of the Kur, between the Rivers Ktsia and Nidja, where they live mixed with Armenians. The district of Kazakhi contains twenty-nine little towns or villages (*St. Martin, op. cit.*, ii., 219).

I have already said that I deem Kazak and Kipchak to be to some extent synonymous and I believe, therefore, that it is exceedingly probable that the Kipchaks or Comans, who appear for the first time in the Russian annals in 1055, were, in fact, the same people who made an invasion of Armenia in 1049. This clears up much difficulty in tracing the various threads of Turkish migration, which is much confused when we bring the Kipchaks from the country immediately beyond the Volga, then inhabited by the Kankalis, who, I consider, were a different section of the Turk race altogether. This identification is supported by the very remarkable fact that the long Coman vocabulary, which was analysed by Klaproth, is more like the Osmanli form of the Turkish than any other dialect, while we know that the Osmanli claim descent from the Ghozz Turks.

The Comans were terribly dispersed by the invading Mongols; a portion of them, however, remained behind in their old country, and are still known as Kumuks, and they form an important tribe, living somewhat to the south of the River Kuma. Another fragment is still to be found among the Nogays, one of whose small tribes pasturing still on the Upper Kuma is called Kipchak (*Klaproth's Caucasus*, 155 and 159).

Another section fled to Hungary where they were settled in two districts known as Great and Little Kumay. There is still one curious question which still remains to be mentioned, and that is, when Klaproth was given a list of Coman names to report upon when he went to the Caucasus, he found that these names are still found used there, and mainly among the Circassians.

It would seem from this that the Turkish Comans became the dominant chiefs of the whole northern borderland of the Caucasus; and this accounts for the traditions among the Circassians which point to a different origin for their princes and people, or it may be that, both in the case of the Comans and Circassians, the chiefs are descended from the ancient Khazars.

Before the year 1050, I hold, there were no Comans in south-eastern Russia, and we thus get rid of a second element in the confused population of that area. In the next letter I propose to speak of the Pechenegs. In regard to the alternative names of Berendeens and Bereditches or Berenditches, given by the Russians to the tribe mentioned in the previous letter, I may add a curious passage from the Georgian historian Wakhtang, as abstracted by St. Martin in the work already named. He tells us Thogarmos had eight sons, one of whom was called Bardos; and Bardos, on the distribution of his father's lands, received the country to the south of the River Mtkvari, from the outflow of the *Berdudji* as far as the confluence of the Mtkvari and the Rakhsi (Araxes). This Bardos founded a town there called Bardair (Bardaa), in which he lived.

St. Martin adds, that the Berdudji is the same river as the Debete or Boitkhalo in the centre of Georgia (*op. cit.*, ii., 183). It seems to me that the river probably gave its name to the Berenditches, who were also styled Berendeens from the adjacent town of Berdaa or Bardaa, as Von Hammer suggests.

Yours, &c.,

HENRY H. HOWORTH.

DERBY HOUSE, ECCLES.

———:o:———

THE EARTH'S ROTATION.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—The involuntary journey which a man living at the Equator accomplishes daily, by being carried round on the surface with the earth's rotation on its axis every twenty-four hours, will be through a distance of about 25,000 miles, or 500 yards per second.

While the involuntary journey accomplished daily by the Arctic ship 'Alert,' in its late winter-quarters at N. lat. 83° 20′, would have been barely through 2,500 miles, or 50 yards per second, or about a tenth of the equatorial diurnal distance. The difference in friction alone will probably account for the lowered temperature at N. lat. 83° 20′; but many disturbing causes, such as circulation of water and air of different temperatures, &c., would complicate the calculation.

We may suppose that at the Pole the absence of friction (which would probably accompany the reduction to nil for the distance of the involuntary journey) would cause a cold quite insupportable to every living organisation for some distance (say 400 miles) around the actual Pole.

The subject is probably well known to mathematicians; but if explained in a popular manner, I think it would be very interesting to many readers at the present time.

Your constant reader,

J. ALFRED NOVELLO.

VILLA NOVELLO,
Via San Giacomo, Genova.

LIVINGSTONIA.—In our *résumé* of the address of the President of the Royal Geographical Society (see p. 338 of our December number), reference was made to the labours of the Established and United Presbyterian branches of the Scottish Church in Central Africa. As this seems open to misapprehension, we beg to call attention to the following, received from Mr. James Stevenson. "The recent initiation of missions in the interior was the work of the Scottish Free Church, which fourteen years ago surveyed the ground, last year founded the settlement of Livingstonia, entirely paid for and under the supervision of Mr. Young, R.N., who is still in her service, launched the steamer on the lake, and maintains it there. What has created misconception is the circumstance that the Free Church allowed a member of the Established Church to go with their party eighteen months ago to look for a site for an Established Church Mission quite apart from Livingstonia, and the liberality of the United Presbyterian Church, which sent and paid the salary of an able medical missionary till the education of the ordained medical man designated by the Free Church should be completed. I may properly add that all the Scottish Missions in Southern Africa, with the single exception of a mission of the United Presbyterian Church, whose principal work is Western Africa, belong to the Free Church."

Proceedings of Geographical Societies.

—:o:—

ROYAL GEOGRAPHICAL SOCIETY.

Meeting of November 27th, 1876.

CENTRAL AFRICA.

THE PRESIDENT, SIR RUTHERFORD ALCOCK, took the chair at 8.30 P.M.

A series of papers relating to Central Africa, and all referring to the results of the Expedition of the Khedive, under the direction of Colonel Gordon, to the region of the Nile Lakes, were read. The first, by Col. GORDON, related to

"OBSERVATIONS ON THE NILE BETWEEN DUFFLI AND MAGUNGO."

At the distance of about 20 miles to the south of Duffli the river begins to widen out, and the current becomes therefore less rapid; and from that point to Magungo the river is nothing more than a portion of Lake Albert. The current is very slow, not more than half a mile an hour; the bed is wide, sometimes as much as two or three marine miles, and it is filled with islands of papyrus. The banks of the river are fringed with papyrus, and are difficult of approach. The country is very populous—much more so than any other portion of Africa that Col. Gordon had seen—and the natives are well disposed. They were greatly astonished at the sight of the steamboat. The banana cultivation is met with at a distance of 40 miles to the south of Duffli, and it continues on south for 20 miles, when it ceases, and is not met with again until the Lake is neared, when it reappears. He did not know the cause of the interruption in the banana cultivation. At the distance of 50 miles to the south of Duffli the natives wear each a skin, farther on they clothe themselves with the bark of a tree. Col. Gordon believed that, taking Ratatchambé as a centre, and describing a circle with a radius reaching to Fashoda, that circle would include all the tribes that go entirely naked—a zone outside of that circle would include those half clad—and a zone outside that would contain the tribes who fully clothe themselves. He had not seen the branch which leaves the Nile and flows to the north-west, according to Mr. Gessi; having troops with him he could not delay his voyage to make close examinations of the country, but he had no doubt of its existence. He had found Sir Samuel Baker's map quite correct for the northern portion of the lake. The mouth of the Victoria Nile is very difficult to find, the whole coast being sown with papyrus islands; there are thousands of them, and one can hardly say where the lake ends and where the river begins. There is no current, and the water is shallow. One can hardly conceive the number of villages (Zeribahs) which exist on the left bank of the river. In this it resembles the Shillook country in former days. The lake has a sad and deserted appearance, and the country around is very uninteresting. The steamboat ran very well, and from what he had seen was sufficient for the service.

The second paper read, also by Colonel GORDON, was

"NOTES ON THE VICTORIA NILE BETWEEN MAGUNGO AND FOWEIRA."

From Magungo to Murchison Falls the river is navigable, and the current does not exceed one knot an hour; but from that point to the Karuma Rapids, 9 miles below Foweira, the river is full of strong rapids. The country is almost deserted by man. The banks of the river are bordered by trees. In a word, it is a wilderness. It seems that the Nile runs through a plateau from Foweira to Murchison Falls. Then, in a space of 10 or 15 miles, it has a fall of 700 feet. The rapids near Foweira are strong, but between them the river flows tranquilly. It is within the 10 or 15 miles space above alluded to that the waters fall most. Nothing can describe the solitude of this deserted country. The wars between Kaba-Rega and Aufina have prevented the natives from settling in the territory thus subjected to invasions from both directions.

The third paper gave a summary of geographical and scientific results accomplished by Expeditions made by the Government of the Khedive of Egypt, during the three years 1874, 1875 and 1876.

The next paper, communicated by the Rev. E. J. DAVIS, related to

"THE KHEDIVE'S EXPEDITION TO THE LAKE DISTRICTS."

The expedition under Colonel Gordon started from Cairo on the 23rd February, 1874, and reached Gondokoro on the 16th April, 1874. Finding that his government consisted of the three military stations, Gondokoro, Fatiko, and Foweira, that the troops were in want of many things, and in arrears of pay, he determined to return to Khartoum to obtain more troops, and to meet his stores. Having done so, he started with the same on 8th June, 1875, but owing to heavy rains and delays he did not arrive at Gondokoro till September, 1874. It was then seen that Gondokoro was unfitted for a station; it was therefore decided to evacuate it, and to establish two stations, Lardo and Rageef, one 12 miles below, and the other about the same distance above, Gondokoro. This evacuation was not completed till the 1st January, 1875, when Col. Gordon descended and made an inspection of the stations, Bohr and the Sobat, returning to Lardo on the 4th March. The remainder of the month of March was spent in the subjugation of Bedden and other hostile Sheikhs near Rageef; and now had to be faced the great difficulty, viz., how to establish a safe communication between the Lake Districts and Lardo.

Taking it roughly at 120 miles, the intervening country was one devoid of supplies, unless taken from the natives by force; in the rainy season the numerous streams were torrents, while in the dry season little water could be obtained. The natives were friendly or hostile, according to one's force, but may be generally said to be hostile. A reconnaissance having shown the Nile to be navigable considerably further south than was supposed, it was determined to establish the line of posts to preserve the communications between the north and south of the province, along the left bank of the Nile, and not to attempt the usual inland road. Keeping to the Nile prevented attacks being made on the stations from more than one side, and secured, at all seasons, a supply of water. The river was found navigable as far as Kerri; thence to the Asua it was possible to take up vessels, but difficult, however, from the Asua junction with the Nile. The river for ten miles was found quite impracticable; thus this ten miles is the only obstacle to a vessel of sixty to eighty tons, excepting, of course, the cataracts of the Nile in Nubia, ascending from the Mediterranean to the Lake Albert.

By the 1st January, 1876, the whole of the sections of the 50-feet steamer and two iron life-boats had arrived at Duffli, and their construction commenced, while troops were massed at Foweira for an advance south towards Victoria Lake. By the end of April 1876, the Lake Albert had been circumnavigated by Mr. Gessi, who found it much of the size it was supposed to be by Captain Speke, with no river of importance entering it. A branch from the Nile, soon after its exit from Lake Albert, flowing to north-west, was discovered; where it flows to is not yet known. The stations at Masindi, Mrooli, and Magungo were formed, and at the end of July the ten-horse-power steamer was completed, and made her first voyage from Duffli to Magungo, at the entrance of Victoria Nile. The Nile may now be considered to be known along its whole course, with the exception of the branches flowing north-west from the Nile after

its exit from Lake Albert, and that flowing from Lake Masanga, half-way between Mrooli and Urondogani. The country generally is quiet and the roads secure. The inflow of ivory continues good; the expenses of the occupation are fully covered by the revenue, which may be put down roughly at £60,000 a year; and the future of the province will depend much on the amelioration of the route from Cairo to Khartoum, and on the enterprise of private merchants, who hitherto have been discouraged from venturing up on account of the insecurity of the routes, which, however, are now safe.

The following paper, by M. KORNOLO GESSI, was next read

"ON THE CIRCUMNAVIGATION OF LAKE ALBERT NYANZA."

With two iron boats, manned with eighteen sailors and twelve soldiers, Gessi left Duffli on the 7th of March, 1876, and arrived at the mouth of the lake on the 18th, their slow progress being attributable to the contrary winds, the incessant rains and the currents. His mission was to explore the part of the river between Duffli and the lake, to visit Magungo and to go round the lake. From Duffli to the lake is 164 miles, and throughout the whole distance the river is navigable, deep, and broad; in certain places exceeding 700 yards. At two-thirds the distance from Duffli there is a large branch which runs in a N.N.W. direction, and probably flows towards Makraka, in the country of the Niam Niam. The country is very rich; the natives are clothed in the skins of antelopes or goats; and the products of the soil are varied, consisting of millet, the wheat of the country, sesame, honey, tobacco, bananas, beans, &c. Cattle are abundant, and comfort and plenty appear to reign among the people.

They arrived at the entrance of the lake at the time of the equinox, and the stormy weather compelled them to wait till the 20th of March, when they again started to traverse the north-eastern corner in the direction of Magungo; but when about two-thirds across a strong land-breeze suddenly sprung up, and prevented them from reaching the coast. On the 30th they arrived at their destination, and the 12th of April found them again *en route*. Early in the morning they arrived near the first islets, which lie 5 to 7 miles distant from the shore. These were found to be full of natives, who had resorted here to escape the pursuit of the troops.

The mainland of the lake is low, the shores sandy, and the interior rich in vegetation and timber. Three cataracts were passed on the 13th, called Humo, Wahambia and Nanza. They proceed from a large river called Tisa, which is never dry. The natives declared that although they had been very far into the interior of Uganda for ivory, they had never reached the source of this river.

Continuing their course on the 15th, they experienced violent weather, which compelled them to secure their boats in a snug harbour, which Gessi named Port Schubra. It contained many villages, and is 250 yards wide, and 600 to 700 in length. On the 18th, after a course of some 40 miles, islands and vegetation were observed in the distance, and 10 miles further they entered a river, which they ascended for 7 miles when they were stopped by papyri and other aquatic vegetation. From the heights a large waterfall leaped down, much grander than the three they had already passed. The river came to an end in this *cul de sac*. A village was found close at hand, but the natives had already fled. After waiting several hours three slowly approached, from whom it was learnt that the waterfall came from waters which accumulate in the mountains and form a river during the season of the rains, but which dry up, together with the river, in the dry season. They also informed Gessi that he was then at the end of the lake, and that he could not get beyond the ambatch, for the water was only as deep as their knees; and they assured him there was no river at the end of the lake. This country is called Quando, and the inhabitants are suspected of cannibalism.

Clearing out of the river on the 19th, they endeavoured to force a passage through the ambatch, but without success. Keeping to the border of the ambatch fields, they crossed the lake from east to west, a distance of 40 miles, without finding any passage. Finding themselves on the opposite shores they endeavoured to obtain information at a village which lay before them, but the inhabitants fled, carrying off their property. The Nogaras called together their warriors, and made hostile demonstrations. Waiting until their military evolutions were finished, Gessi hoped that some one would approach, but they were very hostile, and he could not get near them with his boats. At the next village, the inhabitants also fled to the hills with their goods, but showed no hostility, and some of them came near enough for the interpreter to make himself heard. Requesting them to send their chief to speak with Gessi, an old man of about sixty years came and sat down on the beach; and in answer to questions put to him concerning the lake, Gessi found that his account perfectly agreed with what they had been told on the eastern side. Nothing further being practicable, preparations were made for the journey north. Not a single harbour or sheltering place was met with along the coast, and in consequence of the violent weather, they were driven 40 miles out of their course.

No currents were noticed during the voyage, except that with strong west winds the water drifted towards the north-east, and with north-east winds towards the south-west. A line on the face of the rocks, about 4 inches above the present water-level, was noticed; but whether it marks the limits of the highest water in the lake could not be ascertained, as the natives on all sides had assured Gessi that the waters neither rose nor fell.

After the reading of the papers by Mr. R. MAJOR, a discussion followed, in the course of which the President bore testimony to the great interest taken both by the Khedive and Colonel Gordon, not only in the cause of geography, but also to humanity, in opening up a communication from the Mediterranean to the Albert and the Victoria Nyanzas. He also expressed the deep regret with which the society had heard of the death of Mr. REBMANN, one of the East African missionaries, who originally called attention to the system of great lakes of Central Africa, and who was one of the discoverers of the snow-covered mountains Kilimandjaro and Kenia. At the time of his death, which occurred in Kornthal near Stuttgart, Mr. Rebmann was engaged in passing through the Press his Dictionary of the Kiniassa language.

Meeting of December 12th, 1876.

THE ARCTIC EXPEDITION.

This, the third meeting of the session, was held in St. James's Hall, which was filled to overflowing. Among those present were H.R.H. THE PRINCE OF WALES, the Duke of Sutherland, Lord Houghton, Sir Bartle Frere, Sir Henry Rawlinson, Sir Alexander Milne, Dr. Petermann, and the Officers of the Expedition.

The PRESIDENT (Sir Rutherford Alcock), in opening the proceedings, said:—Your Royal Highness, my lords, ladies and gentlemen, we are to be congratulated this evening that your Royal Highness has been pleased to associate yourself with the Geographical Society in rendering honour to those who, amidst many perils and singular trials, have done their best to reflect honour and credit on the service and the country which claimed them. We are met here this evening for a twofold object. The first is to give that welcome, that they have so richly earned, to the officers of the Arctic Expedition; and secondly, to hear from their own lips some account of their experiences and their strange trials and adventures in that unknown region, the North Polar

Sea. We have all, no doubt, read with great interest the published Official Report of Sir George Nares, the Commander of the Expedition, but that I consider to be a mere skeleton of what they have to tell us whenever the opportunity is afforded them; it is but the dry bones which they have to bring to life and to clothe with living words before we can thoroughly enter into the great and important service which they have rendered, and appreciate the noble spirit in which they performed their duty. We shall be favoured to-night with an account from three of the senior officers. Captain Sir George Nares will read a paper on the North Circumpolar Sea; Captain Stephenson will read another upon the winter experiences in the 'Discovery'; and Captain Markham will give us some account of the Arctic Sledge-Travelling. These papers will, no doubt, fill up the whole of our time; and the truth is that it is not the extent of geographical discovery nor the scientific results that most deeply touches the fibre of the popular mind at this moment. It is the high qualities that have been displayed by these representatives of our British Navy, and their powers of endurance, unflagging courage, and never-failing spirit of generous emulation, which have touched the best chords of our hearts, and these are the things which we come now to congratulate them on having so successfully displayed. There are many kinds of heroism, many degrees of courage. We are, perhaps, too much in the habit of associating the word "hero" or "heroism" with the battle-field, the storm, and the fight that takes place either between bodies of men on shore or ships at sea; but I think very few will have read through this bare narrative, unfilled up as it is of the hairbreadth escapes, of the constant perils, of the marvellous adventures that these ships and the sledge parties have incurred, without feeling that it is a great mistake to limit heroism to the mere carrying of a flag through storm and peril to victory. These Arctic ships had to be navigated among great ice-floes 20 or 30 feet thick; and as Sir George Nares has well described, if two of these ice-floes clip a ship between them it is crushed like a nut. They are like great blades of some superhuman shears. There is no human force that can possibly resist them. Fancy what it has been navigating through such seas for a month together, never certain from one hour to another whether it will be possible to avoid these great icebergs that are eddying around the ship. And then if you take some account of the sledge-journeys, nothing more marvellous has ever been related. I say nothing of the long night of 142 days, of the lowness of the temperature where 60° below zero has been reached, and where men had to live, and to work, and to plough through the snow, under this intense cold; but these sledge-journeys, I venture to say, have never been paralleled, take them altogether, either in what they achieved or in the dangers and perils they have confronted with the most perfect spirit, without once flagging, even though disease struck many of them down. One incident alone will tell you much. They had to pass a night on one range of hills where the cold was so cruel that they named the place "Frostbite Range." Fancy having to travel through a range of snow-clad mountains and icebergs that was characteristically named Frostbite Range! There was one heroic event among many which was marked in a very few lines by Captain Nares with the due meed of praise, though he was of course anxious not to single out one as deserving more than another, for there has been nothing more gratifying, nothing that reflects more honour and credit upon them and the country, than the generous emulation, the absence of all possible jealousy or rivalry except in the finest and the highest spirit. The sledge-party commanded by Captain Markham, after making one of the most extraordinary passages north over the frozen sea, and over great hummocks of ice through which they had to cut their way, making only 2 miles a day, but having to go over the same distance five times, were at last struck down with fatigue and disease; and when they were 30 miles from the ship, with five of their companions laid helpless on the sledges to be dragged, it was clear that there was no power in human sinew and courage to carry their sledges further. It became clear that no power of their own could carry them to the ship; it was therefore decided that one of the party should endeavour to reach the 'Alert' for assistance, which was accomplished after a lonely walk of 30 miles in 22 hours. You are, no doubt, all anxious to hear from the heroic travellers the whole account of their experiences. I merely venture to say these few words because I know that this assembled crowd is not here without feeling the deepest sympathy, and the most earnest desire to give them the hearty welcome that they have so nobly earned.

Captain Sir GEORGE NARES then read his paper on

"THE NORTH CIRCUMPOLAR SEA."

On the part of the Arctic officers he had to thank them, and, in fact, the whole of England, for the welcome home that had been given to the Arctic Expedition. Time would not admit of his touching more than briefly on matters which he had not mentioned in his official report. He did not pretend to state new facts or to start new theories, but merely to place before them, in a simple form, what he had gathered from nature and from published works. Upwards of one hundred photographs were brought home by the Expedition, representing the exact characteristics of the Arctic Seas, and were now being printed. These might be accepted as nature's own report, which could not possibly be garbled or put on one side. In order to explain his subject more clearly, Captain Nares entered at some length on the action of oceanic currents in the distribution of heat, and on the drifts from the Polar basin southward during the summer season. Those drifts of ice in the Arctic Seas were found to progress about four miles a day. Into the Polar basin, which he considered a locked-up bag, was ever flowing a stream of warm water, pouring in between Spitzbergen and Norway, and another stream of cold water running out on the west, the former carrying a great amount of heat into the north, and the other carrying a great amount of cold to Canada, the west of Greenland, and North America. So great is the difference in climate caused by these two powerful distributors of heat and cold, that the temperature of the sea on the American coast, or the border of the cold current, 2,200 miles from the Equator, is the same as that midway between Spitzbergen and Norway in lat. 70° at nearly double the distance from the Equator. The inhabitants of New York, if they were to bathe in the sea, would actually have to plunge into water of the same temperature as that off the north point of the coast of Norway. Thus, as was to be expected, the lightest ice was found near the inflow of the warm stream; and the heaviest near the outlets. The same kind of ice had been traced all the way from Behring Straits eastward to Banks' Land, and further west to Prince Patrick's Island, and from that to Ireland's Eye, at which point it was lost. Pushing their way in the 'Alert' and 'Discovery,' towards the entrance of Robeson Channel, they gradually realised the accuracy of these facts. No very distinct knowledge could be obtained of the nature of the ice in the Polar Sea; whether it extended to the Pole or across the Pole he could not exactly say, but it was certain that a vast distance was covered with ice throughout the summer, and was not open. The masses were broken up in summer and swayed backward and forward; but there was no such thing as a navigable channel, and in September all became cemented together again. The new formations taking place seven months in the year would more than counterbalance the breaking up in the other five; and as the area of the polar basin could not be less than one million square miles, and its principal outlet between Greenland and Spitzbergen was not more than 300

miles wide, and only the western half was occupied, it was a matter of calculation as to the quantity of ice that could get out, and it was easy to see that some of that remaining must be at least 100 years old. All the driftwood that was found was found in bays open to the west, never in bays opening towards the east. After glancing briefly at the results of the Austrian Expedition, Captain Nares went on to say that from their observations and experience they might reason with confidence that if land existed at the Pole it would be vegetated, and birds would make their way over the 400 miles to be further out of the way of their natural enemies, but no flights of birds were seen. In consequence of the widely-spread belief that the Pole could be reached by other means than by sledging over the ice, he concluded with a few words on the subject:—"Arctic travelling must always be most severe work. I would therefore request our many friends who suggest plans for assisting us over the ice, to first mature their propositions in a more temperate region. Without in any way detracting from the suggestions, I may state that no one can realise what Arctic sledge-travelling really means until he has travelled across country, totally on his own resources—say from London to Edinburgh and back again. If the advocates for ballooning will start from the north of Scotland, carrying their own provisions, visit Iceland, 450 miles distant, and return exactly to their starting-point—for a mistake of 20 miles would be fatal—without receiving any outside aid, then only can we entertain the idea of using a balloon. Time permits me to only briefly allude to the present migration of the Eskimo from the south-east part of Greenland towards the Danish settlements near Cape Farewell, where from ten to twelve become incorporated yearly with the more civilised Eskimo, living happily and in comparative comfort under the well-ordered supervision of Danish officials. Knowing that glaciers cut off these people from travelling south along the west coast of Greenland, we may conclude that they have crossed from Grinnel Land to Polaris Bay, journeyed round the north end of Greenland, and passed to the southward along the eastern shore to richer hunting-grounds, as proved by the presence of numerous bears, which can scarcely exist in regions where Eskimo are unable to obtain sufficient food. Before concluding, I should like to say a few words regarding the Polaris Expedition, for that ship most undoubtedly must have met the same kind of ice that we did. They must be credited with having reached the limits of navigation on the east side of Robeson Channel, as we did on the western side, and Captain Buddington was perfectly correct when he stated they could go no farther. Had he not been overpowered by a majority, he would have informed us of the nature of the Polar ice some years ago. We all look upon Captain Buddington as a very hardly-used man; and had the travelling parties from the 'Polaris' been organised as Hall would doubtless have done, on the plan first originated by Sir E. Parry, they would have told our story to the world instead of our doing so now. However, it must be remembered that where we had 120 disciplined men, the 'Polaris' had only a crew of twenty-seven.

Captain STEVENSON of the 'Discovery,' next read his paper on

"ARCTIC WINTER EXPERIENCES,"

Arctic service, he remarked, had always been and would always be popular in the Royal Navy. It had been said that the service was the finest nursery for seamen in the world, though so far as actual seamanship went, the ships were frozen up for eleven months out of the twelve. But the service was admirably adapted for developing the courage and self-reliance of the men engaged in it. The 'Discovery' went into winter quarters on the 26th of April, in a well-sheltered inlet, in which the ship could be frozen in close to the shore and not be subjected to the moving pack. The 'Discovery' was very fortunate in finding a good fiord on the north side of Lady Franklin Sound, which made one of the finest harbours he had ever witnessed. The ship wintered in 12 fathoms of water, within 200 yards of the shore, and surrounded by a country mountainous in the extreme. Here they lay embedded in the ice for ten months and a half. The first thing to be done in preparing for wintering was to land stores and fuel sufficient for six months in case they were burnt out, which was their greatest danger. The pipes and pumps were next drained of water, and the ship well-lighted between decks in order to increase the comfort of the men by giving it a light and cheerful aspect. A layer of snow some ten to twelve inches thick was laid on the deck, but as it was found not to bind, it was mixed with ashes and water, and soon made an admirable macadamised road. As soon as sufficient snow could be found it was piled up outside the ship about fifteen or twenty feet thick. This, and the layer on deck, kept the warmth in the ship, and the temperature on the lower deck ranged from 48° to 56°. On the 16th of October they lost sight of the sun for 135 days. Up to the time that the sun had departed shooting had been carried on, and thirty-two musk oxen, thirty-six hares, six seals, and five eider duck had been bagged, so that when the darkness came on they had no less than 3,053 lbs. of frozen fresh meat in the ship; 800 lbs. a month being the amount usually consumed, the ration being 1½ lb. per man every three days. He could not say much for the delicacy of musk ox, as it was so very musk. Since he arrived in England he had been offered £50 for the head of one of these animals, and people on all sides appeared very much astonished that so few of the skins had been brought home. During that time Lieutenant Archer undertook the survey of the harbour, and some of the difficulties he had to encounter in the work would form a most amusing narrative. Captain Beaumont, too, had great difficulty in his meteorological observations, owing to the freezing of the mercury. Lieutenant Archer, however, took some astronomical observations, but the freezing of the mercury, the cracking of the quicksilver, and the impossibility of reading the observations, combined with other causes, were of such a nature as to call for an amount of zeal and ingenuity which could only be understood by those attempting it. He had been asked since his return if he had not found the darkness very long and tiresome. He considered it by far the most enjoyable time of the whole period spent in the Arctic regions. The ship was very warm and comfortable, and all were employed in the work most interesting to themselves. When the sledging season commenced, men and officers were broken up into parties and separated. The simple stories of these sledging crews would have to be read to be appreciated.

Captain MARKHAM then read his paper on

"SLEDGE TRAVELLING."

After a few prefatory remarks, Captain Markham observed that the sledges that were ordinarily used, and to which a decided preference was given, were what are commonly called eight-man sledges, and the weight carried on each was 1700 lbs., or at the rate of 220 to 240 lbs. per man. The tents were 17 feet in length, affording 14 inches in width for each man to sleep on, and about his own length. Every man was clothed in "duffle," and slept in "duffle" sleeping-bags. They had three meals a day. Breakfast, consisting of a pannikin of cocoa and a quantity of pemmican, was always taken in bed; luncheon consisted of warm tea, four ounces of bacon, and a little biscuit, but the weather was frequently so cold that they had much difficulty in getting the kettle to boil, and were obliged meanwhile to walk sharply about to avoid frostbite. After ten or twelve working hours supper was served, pipes lighted, and an allowance of spirits made to those who were not total abstainers. The mid-day tea was found very

refreshing, and was infinitely preferred by the men to the half-allowance of grog that was usually served out to them. In September 1875, the ship having been established in winter-quarters, and a preliminary sledging party having returned to the 'Alert,' one on a more extended scale left the ship. The temperature on leaving was at zero, but fell during their absence as low as 25° below zero. A sudden fall one day was most disastrous, causing several severe frostbites, resulting in a few cases in amputation. These frostbites were due to their footgear being in a constant state of saturation, caused by the frequent immersions owing to the rotten state of the ice. So deep was the snow that they had several times to use their shovels to clear the road. In twenty days they marched a distance of 200 statute miles, and succeeded in planting the English flag a mile or two beyond Sir E. Parry's highest position. On the 3rd of April, 1876, seven sledges were drawn up in line, packed and provided for an extended absence, and a band of fifty-five officers and men ready and willing to drag them as long and as far as their strength would admit. It was a bright sight to see them before they set out, each of the seven sledges bearing colours worked by some fair hands at home. These seven sledges were to travel together as far as practicable, when the northern and western were to branch off, and the others to return to the ships. The northern division consisted of two officers and fifteen men, and their instructions were to proceed over the ice with the view or reaching as high a latitude as possible. The western division consisted of one officer and seven men; and a third party, belonging to the 'Discovery,' was to explore to the eastward, along a portion of the northern coast of Greenland, while other parties from both ships were engaged in other important investigations. On some occasions the cold was so great as to deprive the men of sleep. The coverlids of their beds were frozen, and when thawed by the heat of their bodies became literally wet blankets. The lowest temperature recorded inside the tent was as low as —25°, and no temperature above zero was registered until the 28th of April, and it never rose to the freezing point until June. The operation of putting on their duffle-jumpers afforded them much merriment, so stiff and hard had they become from the intense cold. For the first three or four weeks their bacon was frozen so hard that they had to put it in their tea to melt, thus cooling the tea, and converting it into a decoction resembling soup. As a rule they were assailed by an intolerable thirst, which it was difficult to assuage for two reasons; first because they could not afford sufficient fuel to condense extra water, and secondly, it was quite impossible to prevent the water in the bottles from being converted into ice, in spite of the tin water-bottles being kept inside the waistband of their trousers.

Captain Markham then described the advance of the northern party. The ponderous nature of the ice, and the heavy weights they were compelled to drag, rendered progress very slow and tedious. Added to which the terrible malady that gradually but surely attacked and prostrated the men, augmented the difficulties that they were called upon to encounter. Large floes afforded the best travelling, but these were rarely met, and in place thereof they had small but heavy floes surrounded by broad belts of stupendous hummocks varying from 15 to 20 feet in height, and from 20 yards to a quarter and half a mile in breadth. Around these hummocks were deep snow-drifts, through which they frequently floundered up to their waists, the snow on the actual floes being as much as 2 to 3 feet deep. As they advanced in a northerly direction these floes got larger, and heavier hummocks were encountered, until at their extreme point they arrived at a perfect labyrinth of squeezed-up hummocks, through which with sledges it would be most difficult and tedious to make any progress. The total distance travelled by the northern party was 600 statute miles. The western division was eminently successful, and travelled 725 miles. After alluding to the work done by the eastern division, the return of which brought to a conclusion the sledging operations of the Expedition, Captain Markham concluded by paying a tribute of praise to those noble fellows who, overtaken by sickness, bore their suffering with manly fortitude and endurance, and with praiseworthy devotion to the object they all had in view.

His ROYAL HIGHNESS THE PRINCE OF WALES then rose and said:—Ladies and Gentlemen,—After the admirable address that we have heard on the part of the President, and the able and most interesting papers which have been read by Captain Sir George Nares, Captain Stephenson, and Captain Markham, it would be perfectly superfluous on an occasion like the present for me to make any remarks; but it affords me the highest pleasure and the highest satisfaction to be allowed to move a vote of thanks to these gallant officers for the interesting and pleasant evening they have afforded us, and also to ask you all, ladies and gentlemen, most enthusiastically and most cordially to give them that hearty and British welcome which they have so thoroughly deserved.

Sir HENRY RAWLINSON, in seconding the motion, said:—Your Royal Highness, Sir Rutherford Alcock, Ladies and Gentlemen,—As I had the good fortune to represent the Royal Geographical Society in those preliminary discussions two years ago which led to the despatch of the Arctic Expedition, I am naturally much pleased at being allowed on this occasion to second the vote of thanks which has been proposed to you by His Royal Highness the Prince of Wales, to be given to the officers of the Arctic Expedition by the Royal Geographical Society on their return from their perilous voyage. Ladies and gentlemen, ample justice has been done, but not more than was thoroughly deserved, to the public services of Sir George Nares and his companions, both by our excellent President in his eloquent opening address, and also by the remarks of His Royal Highness, whose solicitude is well known for the national interests and the national honour. He is never more at home than when he is bestowing well-merited praise on British officers who have done their duty. But, ladies and gentlemen, I venture to suggest that while full justice has been done to the public and professional services of Sir George Nares and his companions, sufficient attention, perhaps, has hardly been drawn to the scientific services of those officers, which, nevertheless, is what principally concerns this Geographical Society as a practical scientific body. It will be remembered that when the Geographical Society, in concert with the Royal Society and other leading scientific bodies, recommended the despatch of an Arctic Expedition, the scientific advantages of such a measure were especially dwelt upon. It was urged, and it was urged with truth, that the despatch of an Arctic exploring expedition to a high northern latitude was a necessary complement to the voyages of the 'Challenger,' and it was mainly in defence of this view that the Government acceded to the prayer, and summoned Sir George Nares from the command of the 'Challenger,' at one extremity of the globe, to the command of a sister expedition at the other. And what has been the result? Although the unreachable Pole has not been reached, still the expectations of Government and all the friends of the Society have, I venture to say, not been disappointed. Those who have listened this evening to Sir George Nares' ingenious argument, and have reflected upon the vast amount of observation, of thought, and of inquiry, which was necessary for the elaboration of those arguments, must feel inclined to place him in the first rank of Physical Geographers. The scientific materials, indeed, which he has accumulated in the command of these two expeditions, his multitudinous observations, and his extensive research, have not only added greatly

to his personal reputation, but have reasserted for England that leading place which she formerly occupied among the scientific maritime nations of the world. And, ladies and gentlemen, I will venture on one word further before I sit down. I would remind you that greatly as we must admire the public and professional services of Sir George Nares and his officers, greatly as we value those services, and we do greatly value them, still his scientific additions to our acquaintance with the laws and operations of Nature, in regions hitherto very little known, are the most lasting and most important portion of his labours; not ministering to the glory of a single profession or a single nation, but adding to the great sum of human knowledge, and thus contributing to the happiness and welfare of all mankind. In grateful admiration, then, of the public, the professional, and the scientific services of Sir George Nares and his companions, I venture to recommend most heartily to the approval of the Fellows the vote of thanks and congratulation which has been moved by His Royal Highness the Prince of Wales.

The vote of thanks was accordingly carried, with three hearty cheers for the crews of the Expedition.

———:o:———

BERLIN GEOGRAPHICAL SOCIETY.

November 4th, 1876.—Baron RICHTHOFEN in the chair. The President referred to the important results achieved by the English Arctic Expedition, and informed the meeting that several extra meetings would take place in the course of the present session, at which lectures would be given by celebrated travellers. Captain Schleinitz would lecture on the Cruise of the 'Gazelle,' Dr. Jagor on Further India, Dr. Brehm on Siberia, and Dr. Riess on his travels in South America.

Dr. NACHTIGAL delivered an obituary address on Dr. Otto Ule, of Halle, dwelling more especially upon the public spirit of the deceased and his amiability of character. They proposed to raise a subscription for the benefit of his uneducated children.

Dr. BASTIAN delivered a second lecture on his travels in America, and more especially in Colombia. He confined himself on this occasion to the ancient civilisation of this country, and the mythology of its aborigines.

Dr. NACHTIGAL read the following letter from Dr. J. Pogge, dated 3rd May, 1876, Mona Cadinga, on the Lulua:—

"I yesterday crossed the Lulua and arrived at Cadinga. On the 16th September last year I left Kibondo, and on the 9th December I reached Quinzemena, the 'Musumba,' *i.e.*, big camp, of the Muata Yamvo. On the 17th April I started upon the return journey. I am compelled to remain here until the beginning or the middle of June, to wait for the subsidence of the waters, for rivers and swamps are difficult to cross now, and I have already lost four out of my six riding oxen. I had no opportunity to forward a letter from Musumba. My carriers, who had only been engaged to proceed to Musumba, refused to return alone, stating that the journey was too long. My articles of barter are nearly exhausted, and I left Musumba on that account, so as to bring my carriers as far as this place on the Lulua, whence I am about to send thirty of them without burdens to Kibondo or Malange, who will take with them this letter.

"I stayed altogether a little more than three months at Musumba. I was unable to proceed further to the north or north-east, as, in spite of repeated attempts, the Matiamvo would not permit it. I was forced to content myself with going six days' journey to the south-east, accompanied by five carriers. On arriving at Injibaraka, a village three days' journey to the east of the Casserigi river, a messenger sent by my interpreter, Germano, overtook me, and begged me to return, as Matiamvo was full of suspicions, and had threatened to have me brought back by force should I not return voluntarily. I should not, however, have allowed this threat to interfere with my proposed visit to the Lubilash, to the north-east of Injibaraka, had rain and inundations proved smaller obstacles. The rivulets with steep banks were 5 or 6 feet deep, and oxen and carriers found it difficult to land, whilst portions of the Plain of Injibaraka were covered with 1 or 2 feet of water. We constantly run the risk of sinking into holes 5 or 6 feet deep, filled with water, and it rained incessantly.

"I then returned in a southern circuit to the Efuka ferry over to Calanye river, about a German mile to the east of Musumba, from which place I had been absent between the 28th January and 28th February. This small excursion has proved of great use to me, for it enabled me to ask questions on the geography of the country, from the chiefs, which I did not dare to ask at Musumba. For all I did there was reported to the Matiamvo, who is a very mistrustful and superstitious negro.

"My diary, I believe, will meet the requirements of the Society. I have laid much stress upon geographical information. I know the extent of Matiamvo's empire, and am well informed as regards the countries between the Guango and Kassai. Petermann's map of 1874 is very defective and full of errors.* I have laid my road by compass, estimating the distances by my watch, and hope to be able to continue this itinerary as far as Kibondo. I shall hand this book *verbo tenus*, to the Society. I have collected plants, butterflies, beetles, specimens of metals, sixteen negro skulls, woods, utensils, &c. All the skulls are more or less injured. They belong to the Cauanda (Cassanda ?) tribe, living four days north of Musumba, between the Luiza and Calangi, amongst whom the Matiamvo recruits his slaves. Molua skulls were by no means rare at Musumba, but it would have been a mistake had I laid myself open to reproach for the sake of a skull.

"I hope to reach Kibondo in the middle of August. I shall there remain a few days and then proceed four days' journey to the Chipaka, on the road to Cubango, where, my guide Ebo tells me, metal similar to that found by me *en route* (copper ?) is met with. By the end of September or the beginning of October, I may be at Malange. I propose to proceed as rapidly as possible to Loando, and return with the first steamer to Europe."

The remainder of the letter refers to pecuniary affairs. It appears that Dr. Pogge was presented by the Matiamvo and the Lucokasha (?) of Musumba with three or four hundred pounds of ivory, which he was "not able to decline nor willing to throw into a river," and which he proposes to sell in Angola.

* Which need not cause surprise, as the country explored by Dr. Pogge has, for the greater part, not been explored by European travellers.

NOTICE.

The Office of THE GEOGRAPHICAL MAGAZINE *is at* 57 *&* 59, *Ludgate Hill, E.C.*

Manuscripts sent to the Editor cannot be returned, nor can the Editor be responsible for them.

Letters and Articles intended for insertion should be written on one side of the paper only, and must be accompanied by the name and address of the writer; not for publication, but as a mark of good faith.

The right of translation is reserved.

Annual Subscription and Postage, £1, Inland. Foreign Orders must be accompanied by P.O.O. or Cheques to include the full amount of Foreign Postage. Post Office Orders to be made payable to Messrs. Trübner & Co., 57 & 59, Ludgate Hill, London, E.C.

A Map
OF THE
SOUTH AFRICAN REPUBLICS.

By E. S. Ravenstein.

Scale 1: 2.000.000.

0 10 20 40 60 80 Sta. Miles.

The Figures express the Height in Engl. Feet.

26° 27° 28°

22° 23° 24° 25° 26° 27° 28° 29° 30°

Bamangwetsi Country
Bamangwato
Matabele Country
Matabeleland
Mashonaland
Limpopo R.
Shoshong 3338
Mashee 2878
Tlopepe
Selinje
Boatlanama, 2697
Kopong
Litzyana
Moruakhomo
Shokhuan 2914
(Koloberg) 3634
Kanya, 3889
Chuan, 3018
Tlisan
Molapo
2950
Lotlokana R.
Marokana
Tswai Salt Pan
Hart R.
Kuruman R.
Matlabas R.
Mahalapye
Mankolaste
Makuatse
Mt. Morotsi
Kliprivier, 2833
Palla
Palla Drift, 2853
Woodebo's Draai
Mutzi Mts.
Marico R.
Marico Drift 2878
Klip Kuil
Kaarn K. 3580
Hol. F.
Wit Fontein Mts.
Vlieg Berg
Franks Sp.
Gamaqua
Pilans B.
Reuds Kloof
Zoetrust
Bucklings
Sprinkhorn
Dreyer Elands R.
Hermannsburg
Lotlokana R.
Bristanburg 3770
Maids Kraal
Lichtenburg
Roode Kan
Wit Kan
Harmonie
Lichtenburg
Esterhuis
Otto
Potchefstroom 3900
Hartebeest Fontein
Marikana
Klerksdorp
Mamusa or Massau
Masusa
Johannesburg
Diamonds
Jacobsdal
Mooi R.
Vaal R.
Transvaal
Mooi F.
Diamonds
Bloemhof
(Saron)
Petrusburg
Hermans Drift
Pretorius Drift
Potchefstroom
Commando Dr.
Marnewyk
Kroonstad
Vulcan R.
Rhenoster R.
Rhenoster Kop
Smidt's
Rensburg
Kopje Alleen
Taung
Gastroom
Christiana
Boetschap
Koutpans Drift
Vaal R.
Middel Veld
Pearl B. (Flat B.)
Hebron
Flat Berg
Paarde B.
Barkly
Boschof
De Beers
Du Toits Pan
Olifant F.
Kimberley
Modder R.
Aprons or Efford's
Jacobsdal
Fortjes dam
Landdrig F.
Kiet R.
Ramah
Groot F.
Taurus
Fauresmith
Philipstown
Philippolis
Orange R.
Heidelberg (Bethulie)
Aliwal North 4000
Zand R.
Taung R.
Vilcue
Mapororo
Mt. Masilo
Wynberg
Klein Vet R.
Beacon
Kaarom
Farm
Marumetsie
Mpukani
Mperapu
Batabane
Nooitgedacht
Tidbury
Norvals R.
Caledon R.
Moroka's Land
Taba Unshit
Bloemfontein 4250
Platberg
Barolong
Boards Kloof
Paarde Kuil
Bethany
Reddersburg
Jan Smit's R.
Jammer Dr.
Masuru
Mary
Wepener
Rouxville
Sloam
Taba Morena
Boomplaats
Leeuw K.
Bersheba
Smithfield
Olifant's Berg
Hebron
Bethesda
Moross
Kok Drift
Caledon R.
Orange R.
Quathlamba or Drakensberg
Basutoland
Kathlong
Leolo Mts.
Mashasha
NW Limits of Forest
Berula
Palatsie 2729
Chopa
Lotsani
Mahalapye
Mt. Morotsi
Kliprivier, 2833
Palla
Palla Drift, 2853
Woodebo's Draai
Mutzi Mts.
Marico R.
Klip Kuil
Kaarn K. 3580
Hol. F.
Wit Fontein Mts.
Vlieg Berg
Franks Sp.
Gamaqua
Pilans B.
Reuds Kloof
Zoetrust
Bucklings
Sprinkhorn
Dreyer Elands R.
Hermannsburg
Bristanburg 3770
Maids Kraal
Lichtenburg
Roode Kan
Wit Kan
Harmonie
Lichtenburg
Esterhuis
Otto
Potchefstroom 3900
Hartebeest Fontein
Marikana
Klerksdorp
Mamusa or Massau
Masusa
Johannesburg
Diamonds
Jacobsdal
Mooi R.
Vaal R.
Transvaal
Mooi F.
Diamonds
Bloemhof
(Saron)
Petrusburg
Hermans Drift
Pretorius Drift
Potchefstroom
Commando Dr.
Marnewyk
Kroonstad
Vulcan R.
Rhenoster R.
Rhenoster Kop
Smidt's
Rensburg
Kopje Alleen
Taung
Gastroom
Christiana
Boetschap
Koutpans Drift
Vaal R.
Middel Veld
Pearl B. (Flat B.)
Hebron
Flat Berg
Paarde B.
Barkly
Boschof
De Beers
Du Toits Pan
Olifant F.
Kimberley
Modder R.
Aprons or Efford's
Jacobsdal
Fortjes dam
Landdrig F.
Kiet R.
Ramah
Groot F.
Taurus
Fauresmith
Philipstown
Philippolis
Orange R.
Heidelberg (Bethulie)
Aliwal North 4000
Zand R.
Taung R.
Vilcue
Mapororo
Mt. Masilo
Wynberg
Klein Vet R.
Beacon
Kaarom
Farm
Marumetsie
Mpukani
Mperapu
Batabane
Nooitgedacht
Tidbury
Norvals R.
Caledon R.
Moroka's Land
Taba Unshit
Bloemfontein 4250
Platberg
Barolong
Boards Kloof
Paarde Kuil
Bethany
Reddersburg
Jan Smit's R.
Jammer Dr.
Masuru
Mary
Wepener
Rouxville
Sloam
Taba Morena
Boomplaats
Leeuw K.
Bersheba
Smithfield
Olifant's Berg
Hebron
Bethesda
Moross
Kok Drift
Caledon R.
Orange R.
Quathlamba or Drakensberg
Basutoland
Kathlong
Leolo Mts.
Mashasha
NW Limits of Forest
Berula
Palatsie 2729
Chopa
Lotsani
Mahalapye
Mankolaste
Makuatse

28° 29° 30° 31°

Zambezi R. Motloutsi R. Shashi R. Limpopo R. Crocodile or Bempe R. Nyl or Magalakwena R. Baganaoa R. Bamapela Bamaletsi Baramapula or Batsuila Bapedi Amaswazi Amatonga Amazulu Basuto Land Adam Koks Land Orange R. Vaal R. Valsch R. Buffalo R. Tugela R. Umvoti R. Umkomanzi R. Umgeni R. Umkomaas R. Umzimkulu R. Umtamvuna R. Ingwangwana R. Umzimvubu R. Kei R. Great Fish R. Great Kei R. Umtata R. Umzimkulu R. Umtamvuna R. Ingwangwana R. Umzimvubu R. Kei R. Great Fish R. Great Kei R. Umtata R.

Charibe Mts. Banyai Balonkwa Baluku Bapedi Amaswazi Amatonga Amazulu Basuto Land Adam Koks Land

Pietermaritzburg Durban Johannesburg Pretoria Middelburg (Nazareth) Lydenburg Barberton Heidelberg Springbok Vlakte Nylstroom Potgietersrust Pietersburg Zoutpansberg Waterberg Rustenburg Marabastadt Zeerust Mafeking Vryburg Kuruman Kimberley Bloemfontein Ladysmith Newcastle Harrismith Bethlehem Colenso Weenen Estcourt Greytown Weston Giants Castle Cathkin Peak Buta Buta Mt. aux Sources Molappo Leydenburg Spitskop Alexandria Richmond Umzinto Stanger Tugela R. Umvoti R. Umkomanzi R. Umgeni R. Umkomaas R. Umzimkulu R. Umtamvuna R. Ingwangwana R. Umzimvubu R. Kei R. Great Fish R. Great Kei R. Umtata R.

Transvaal Orange Free State Natal Cape Colony Basuto Land

Limpopo Valley Rand Hoogeveld Karroo Drakensberg Witte Bergen Koode Bergen Platte Berge Koode Berge Zoutpansberg Waterberg Magaliesberg Witwatersberg Drakensberg Witte Bergen Koode Bergen Platte Berge Koode Berge Zoutpansberg Waterberg Magaliesberg Witwatersberg Drakensberg

Limpopo Valley Rand Hoogeveld Karroo Drakensberg Witte Bergen Koode Bergen Platte Berge Koode Berge Zoutpansberg Waterberg Magaliesberg Witwatersberg Drakensberg

Limpopo Valley Rand Hoogeveld Karroo Drakensberg Witte Bergen Koode Bergen Platte Berge Koode Berge Zoutpansberg Waterberg Magaliesberg Witwatersberg Drakensberg

Limpopo Valley Rand Hoogeveld Karroo Drakensberg Witte Bergen Koode Bergen Platte Berge Koode Berge Zoutpansberg Waterberg Magaliesberg Witwatersberg Drakensberg

29° 30° 31°

Geograph. Mag. 1877.

28° 29° 30° 31° 32° 33°

22° 23° 24° 25° 26° 27° 28° 29°

Makalaka

Matabele Land or Kaffirs

Mashonas

Banyai

Baloakwa

Batoka

Amatonga Country

Mazaruro Mts.

Vaalpen's Mts.

Magaliesberg Mts.

Witwatersrand

Hoogeveld

Roode Koppen

Rhenosterberg

Witteberg

Roode Bergen

Drakensberg

Basuto Land

Adam Koks Land

Moirosa Country

Transvaal or South African Republic

Orange River Free State

Natal

Zulu Country

Tsetse

Gold Downs Blind R.

South Limit of Portuguese Possessions.

R. Motlotsi

Shashi R.

Lime Stone Mts.

Charibe Mts.

Krokedil or Bempe R.

Nyl or Magalakuru R.

Limpopo or Crocodile R.

Marico or Kolobeng R.

Zoutpansberg

Lydenburg

Barberton

Pretoria

Potchefstroom

Rustenburg

Heidelberg

Middelburg (Nazareth)

Lichtenburg

Marico

Zeerust

Wolmaransstad

Ventersdorp

Krugersdorp

Johannesburg

Pilgrim's Rest Gold Fd.

Matabasberg, 4000

Spitskop, 5110

Leolo, 5000

Mauch's 7180

Mashin, 6060

Makurulé

Khenoster Kop

Vaal R.

Harrismith

Ladysmith

Newcastle

Pietermaritzburg

Durban

Weenen

Estcourt

Greytown

Colenso

Giants Castle 9660

Cathkin Peak or Champagne Castle 10,370

Buffalo R.

Tugela R.

Umvoti

Umgeni

Umkomanzi R.

Umhlali

Umhlanga

Umzimkulu R.

Umtamvuna R.

Umzimvubu R.

Umtata R.

Umzimvubu

Umtata

Kokstad

Natal

Port Shepstone

Port Edward

Port St. Johns

Port Grosvenor

Port Durnford

Port Natal

Bluff

Isipingo

Umkomaas

Umzinto

Umvoti

Umsinga

Umzimkulu

Umtamvuna

Umzimvubu

Umtata

Umgazi

Umtentu